FHWA-MA-EIS-78-03-F

U.S. Route 44

Carver Kingston Plymouth Plympton

Plymouth County, Massachusetts

FINAL Environmental Impact Statement and Section 4(f) Evaluation

VOLUME 1

U.S. Department of Transportation, Federal Highway Administration
Massachusetts Department of Public Works

JUNE 1986

FHWA-MA-EIS-78-03-F
FEDERAL HIGHWAY ADMINISTRATION REGION I

U. S. ROUTE 44
(from State Route 58 in Carver to State Route 3 in Plymouth)

In Carver, Kingston, Plymouth and Plympton
Plymouth County, Massachusetts

FINAL ENVIRONMENTAL IMPACT STATEMENT
and
SECTION 4 (f) EVALUATION

Submitted pursuant to 42 U.S.C. 4332 (2) (C) and 49 U.S.C. 303, and in accordance with the Massachusetts Environmental Policy Act (MEPA) EOEA #01027. This action complies with Executive Order 11990.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

and

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

COOPERATING AGENCIES: FEDERAL: Department of the Interior; Environmental Protection Agency; Army Corps of Engineers; Department of Commerce; Department of Agriculture; Advisory Council on Historic Preservation. STATE: Executive Office of Environmental Affairs; Department of Environmental Management; Department of Environmental Quality Engineering; Department of Food and Agriculture; Massachusetts Historical Commission.

ABSTRACT: The Massachusetts Department of Public Works proposes to relocate U.S. Route 44 from State Route 58 in Carver to State Route 3 in Plymouth, through the Towns of Carver, Kingston, Plymouth and Plympton, all in Plymouth County, a distance of 7.48 miles. It is proposed to construct two lanes in each direction as well as four interchanges. The project also includes improvement of Route 3 between the existing Cherry Street and Samoset Street interchanges, and improvement of the Samoset Street interchange.

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Comments on this document are due by DEC 1 1986 and should be sent to Mr. James A. Walsh, Division Administrator, Federal Highway Administration, (above address) and Mr. Robert J. McDonagh, Chief Engineer, Massachusetts Department of Public Works (above address).

9/9/86
DATE OF APPROVAL

C D Reagan
FEDERAL HIGHWAY ADMINISTRATION

ACKNOWLEDGEMENTS

This Final Environmental Impact Statement was prepared under the direction and with the active involvement of the MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS and the U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION by THE ARCHITECTS COLLABORATIVE, INC.

The following firms participated in this study, contributing to specialized fields:

H.W. LOCHNER INC.	Engineering and air quality
L. G. COPLEY ASSOCIATES	Acoustics
CORTELL ASSOCIATES	Water quality
INSTITUTE FOR CONSERVATION ARCHAEOLOGY, HARVARD UNIVERSITY	Archaeology and history

Public officials, as well as residents of the four towns and, representatives of organizations, were generous with their time and knowledge. Their cooperation and assistance are gratefully appreciated.

SUMMARY

A. DESCRIPTION OF PROPOSED ACTION

The proposed FHWA action, and the subject of this Final Environmental Impact Statement, is the relocation of U.S. Route 44 from State Route 58 in Carver, Massachusetts to State Route 3 in Plymouth, Massachusetts, a distance of 7.48 miles, shown on MAP 2-C. Both towns, and the entire relocation are in Plymouth County. Two lanes in each direction are proposed, with four interchanges: at Route 58, Route 3 (Cherry Street), Spring Street in Carver, and in the Plymouth Industrial Park. Improvement of the existing interchange at Routes 3 and 44 (Samoset Street) in Plymouth is also a part of this project, as well as improvement of Route 3 between the existing interchanges at Cherry Street and Samoset Street.

B. OTHER SIGNIFICANT GOVERNMENTAL ACTIONS IN THE AREA

There are no other known significant actions or proposed actions by federal governmental agencies in the project area.

C. MAJOR ALTERNATIVES CONSIDERED

Eight alternatives were considered: no-build; improvements to the existing road; a partial relocation with a partial improvement of the existing road; and 5 complete relocations, of which the one designated as 4-M-5 is the recommended alternative.

D. ENVIRONMENTAL IMPACTS

* The relocation of 28 properties, of which 22 are residential, 5 commercial and 1 residential/commercial. Fifteen of the 28 are in Plymouth, of which 10 homes and three businesses are affected by the improvement of the Routes 3/44 interchange at Samoset Street. However, further study of this interchange in the design period may result in a reduction of the number of properties affected.

Two structures, on Richards Road in the Plymouth Industrial Park, constructed in 1984, are located within the right of way for the connector road ramp in the S.E. quadrant of the interchange within the Park. One is a microwave tower owned by Blue Cross/Blue Shield and the other is an office/warehouse building occupied by Ceeco Corporation. Further studies will be conducted during the design phase to fully assess the impact to these two structures and any mitigation measures that could be taken to save them.

Twelve of the 28 total are in Carver and one in Plympton. Eight of those 12 and the one in Plympton are affected by the relocation of Spring Street as part of the interchange at that Street. The remaining four in Carver are affected by the right of way for the highway itself.

* The removal of 28.67 acres of wetlands of which 5.16 acres are cranberry bogs. The 23.51 acres of wetlands other than cranberry bogs will be replaced by 29.6 acres of created wetlands as part of the project. Replacement of the cranberry bogs will be at the present owners' option.

* The acquisition of 26.05 acres of the Kingston State Forest. The Mass. Department of Environmental Management (DEM) which manages the Forest has made an arrangement with the Mass. Department of Public Works whereby the latter will purchase and transfer other land to DEM to offset its losses in the State Forest.

* Acquisition of 9.37 acres of Camp Nekon, owned by the Town of Kingston. The DPW is committed to the functional replacement of those 9.37 acres.

* The right of way of 4-M-5 crosses the Annasnappet Archaeological District. However, there is a Memorandum of Agreement which states that the Massachusetts State Historic Preservation Officer, the Advisory Council on Historic Preservation, the FHWA and the MDPW have agreed that avoidance of the District and preservation in place are not feasible alternatives, and that mitigation in the form of data recovery will take place in accordance with stipulations set forth in the Memorandum.

* Relocation of Route 44 will result in a major new source of noise in what is now a very quiet environment. Three locations will have noise levels that approach or exceed the FHWA noise abatement criteria of 70 dBA, and one will experience an increase of more than 15 dBA over the existing noise level. Two of the four are at the existing Route 3/44 interchange at Samoset Street, where a noise barrier is proposed. One is at the new interchange at Cherry Street, where a noise barrier is also proposed. Noise barriers are also proposed along relocated Route 44 at Brook Street and relocated Pleasant Street.

* The Plymouth Industrial Park will be serviced directly by an interchange which could readily serve an industrial zone in Kingston, as well. Similarly, the Spring Street interchange could serve a large industrially zoned area in Plympton. Other types of development are not likely to be encouraged, due to the large tracts of publicly and institutionally owned land, and the cranberry bogs and wetlands through which a relocated Route 44 will pass. The secondary impacts due to the improved access to the industrial parks will be minimal.

* Relocated Route 44 and the Spring Street interchange will divert traffic now using local neighborhood streets in Plympton and Carver to reach a plant with large employment situated in Plympton on Spring Street very close to the proposed interchange.

* A closed drainage system will be provided throughout the length of relocated Route 44, including sedimentation basins, thereby shielding the Plymouth Aquifer, which underlies almost the entire project area.

* It will facilitate the east-west movement of traffic for the considerable tourist attractions in the area, thereby alleviating conditions on local roads and improving the economic development of the region.

* It will separate through and local traffic, thereby lowering the accident rate and relieving congestion on existing Route 44.

* The improvement of existing Route 3 between the Cherry Street and Samoset Street interchanges, the improvement of the latter interchange, and the rebuilding of the Cherry Street interchange as part of the relocation of Route 44, will alleviate traffic congestion in that area.

E. AREAS OF CONTROVERSY

Issues and areas of controversy identified during the course of the study, including those raised by agencies and the public, are listed below:

* The filling of wetlands.
* The taking of cranberry bogs.
* The taking of homes.
* Impact on Plymouth Aquifer.
* Chloride impacts on public and private wells.
* Width of right of way of median.
* Impact on Section 4 (f) properties.
* Impact on rare and endangered species: White-Bracted Boneset.

F. SIGNIFICANT UNRESOLVED ISSUES

The following issues are unresolved until the project enters subsequent phases of project development:

* A further geometric design study for the existing Route 3/Route 44 interchange at Samoset Street.
* Selection of site for replacement of existing park and ride facility in Plymouth.
* Specific replacement lands for the Kingston State Forest and Camp Nekon.
* Design of created wetlands.
* A further geometric design study, for the Connector Road ramp in the S.E. quadrant of the interchange in the Plymouth Industrial Park will be undertaken to try to avoid two structures - BC/BS microwave tower and SEECO Building - located with the right of way.

G. OTHER FEDERAL ACTIONS REQUIRED FOR IMPLEMENTATION OF THE PROPOSED ACTION

* Section 404 Permit (Bridge excavation disposal), U.S. Army Corps of Engineers.
* Section 401 Permit, Water Quality Certification (U.S. Clean Water Act) administered by Massachusetts Department of Environmental Quality Engineering, Division of Water Pollution Control.

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SECTION 1

PURPOSE AND NEED FOR ACTION

1. REVIEW OF NEED AND PROJECT ACTION TO DATE

The need has long been recognized for improvements to U.S. Route 44 because it is an important east-west highway serving southeastern Massachusetts, and particularly the historic center of Plymouth. FIGURE 1-1-1 shows Route 44's dual function: it is a through route from Plymouth to Providence R.I.; it is also a major link to Interstate 495 and Boston's circumferential highway system, connecting with 4 arterials - Routes 3, 24, 25 and Interstate 95. The last unimproved section of Route 44 is the one under study - approximately 7 1/2 miles from Route 58 to Route 3.

At its western end in the town of Carver, Route 44 winds through rural areas and has several sharp turns and other substandard geometrics, resulting in high accident rates in a number of locations. At its eastern end in Plymouth, it traverses an area characterized by increasing urbanization, and just before its interchange with Route 3, it goes through a stretch of intensive highway-oriented development, resulting in severe congestion and a high accident rate.

As a result of studies dating back to 1963, the realignment of Route 44 between Middleborough Circle and Route 58 in Carver has been completed. Proposals were made in 1967-68 for its improvements from Route 58 to Route 3A in Plymouth. When the section from Route 3 to Route 3A met with a strong community concern about the intrusion of a highway to a densely populated and historical section of Plymouth, no action was taken. Later a study was made to improve the section of Route 44 between Route 58 and Route 80 in Kingston, but that too resulted in no action because the report had not complied with the then new federal environmental legislation.

The present study was started early in 1977 and was funded in part under the Economic Growth Center Development Highway Program of the Federal Highway Administration. Plymouth had been selected as an Economic Growth Center by Governor Dukakis, and as an Economic Development Center by the region's planning agency, The Old Colony Planning Council. An improved Route 44 was considered to be a significant factor in these designations and in its potential for improving Plymouth's economic position particularly through the development of its Industrial Park.

The initial step in this process was the preparation of an Environmental Overview Summary, the purpose of which was to identify the need for improving Route 44 and to make a preliminary assessment of the potential impacts of various alternative methods of doing so. The Summary was published in November 1977, and benefited greatly from the contributions and participation of The Old Colony Planning Council and the Southeastern Regional Planning and Economic Development District, as well as from federal, state and local officials, and the general public. Six public information meetings were held in the study area to keep residents and officials informed.

The Draft Environmental Impact Statement was approved in April 1979. It was reviewed at a public hearing in June 1979, which was followed by a series of

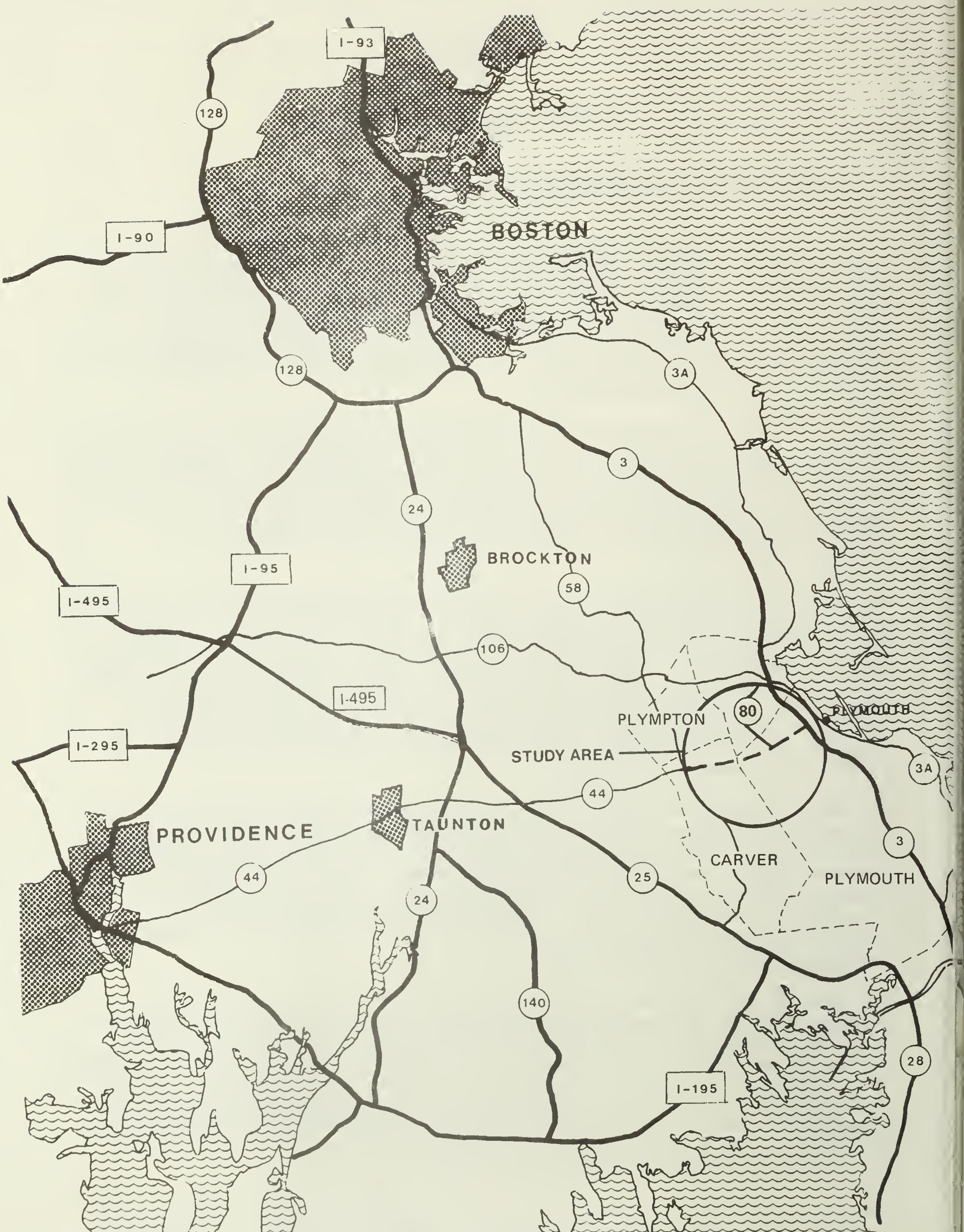


FIGURE 1-1-1 REGIONAL HIGHWAYS

meetings extending over the next 3 years with community officials, state and federal agencies, organizations and individuals. This process involved adjustments to the corridor designated in the Draft E.I.S. as 4-M-1, and resulted in the preferred Alternative 4-M-5 in this Final E.I.S. Studies to complete the Final E.I.S. began in October 1983.

2. PROJECT OBJECTIVES

The following general objectives provided the basis for studies to determine the optimal method to improve Route 44, based on traffic needs and regional concerns.

- Serve as the final link in the east-west system of roads created by Interstate 495, and Routes 3, 24 and 25.
- Upgrade physical characteristics of Route 44 and thereby improve traffic flow and reduce accidents.
- Provide direct access to as many of their industrial zones as possible in the study area.
- Separate through and local traffic as much as possible and keep non-residential traffic from residential streets and neighborhoods.
- Recognize and plan ahead for the natural increase in traffic due to expected growth of the four towns and the region.
- Adhere to pertinent design criteria for limited access roads.
- Minimize impacts on people, buildings, natural features, and historic sites.

3. EXISTING AND PROPOSED TRAFFIC

EXISTING TRAFFIC SERVICE CHARACTERISTICS

Traffic volume counts for the various roadway links in the Route 44 study area were recorded by the Massachusetts Department of Public Works in July and August, 1977 and in May, 1980. Intersection peak hour turning movement and vehicle classification counts were taken July 19 through 22, 1977.

Although this section of existing Route 44 is classified as a Rural Primary two lane roadway, it was analyzed using the Level of Service criteria for urbanized areas. The reason is that within its approximately eight miles there are 17 intersections with local roads as well as numerous curb cuts for driveways all of which result in conditions more characteristic of suburban and urban areas than a rural highway.

Peak hour traffic analysis of five key intersections within the study area indicates that existing Route 44 currently operates at Levels of Service ranging from Level B at the west end of the study area (Route 58) to Levels E

and F at its eastern end in the vicinity of the shopping center and the ramps of the Route 3 interchange. (See FIGURE 1-3-1) Similar results are obtained by the analysis of roadway link traffic volumes, which shows that the ADT volume of nearly 20,000 vehicles in the vicinity of the shopping center and Route 3 approaches, as well as during occasional peak periods elsewhere on the Route, exceeds its capacity. Furthermore, a speed/delay study conducted along Route 44 during off-peak travel periods indicates that deficiencies in the existing alignment and geometric design also influence its operating characteristics. Actual driving time from the intersection of Route 58 and Route 44 in Carver to its interchange with Route 3 in Plymouth, requires an average of 13.5 minutes under ideal conditions at an average operating speed of 35 mph, which is equivalent to Level of Service D for a rural highway. Along most of the Route the relatively low speed average is due not to high traffic volumes or controls at intersections, but rather to deficiencies in alignment and the resulting restrictive posted speed limits of 20 to 40 mph.

TRAFFIC VOLUME PROJECTIONS AND ANALYSIS

Traffic assignments and projections (FIGURES 1-3-3 and 1-3-4) were developed by the Bureau of Transportation Planning and Development (BTPD) of the Massachusetts Department of Public Works. Growth rates used in developing the projections were provided by the Old Colony Planning Council (OCPC). The analysis assumes full development of existing and proposed industrial parks within the general area affected by this project. Trip distribution was completed by BTPD in concert with OCPC.

FIGURE 1-3-3 presents the existing and projected traffic volumes for existing area roadways without any relocation of Route 44. Analysis of intersection capacity for traffic volumes in the year 2000 are summarized in FIGURE 1-3-1. It indicates that under the No-Build Alternative, traffic flow on Route 44 in Plymouth will become intolerable during peak periods. In Carver, operating conditions will deteriorate so as to require capacity improvements at the two intersections with Route 58; however, the remainder of the existing Route 44 to the Plymouth town line will operate at satisfactory service levels.

LEVEL OF SERVICE

Traffic service is measured by the volume of traffic carried by a particular segment of a roadway network relative to the physical capacity of that segment. Physical capacity can be defined as the maximum number of vehicles which can be accommodated by a roadway or intersection during a given period of time, under prevailing conditions. Prevailing conditions include such factors as signal phasing, the degree of interference from other vehicles and pedestrians, composition of traffic lanes or approach pavement, and presence of lateral obstructions in close proximity of the roadway. In general it can be stated that as traffic volumes increase and approach the capacity of the roadway, operating speeds generally decrease and traffic congestion increases.

Operating characteristics of roadways, both existing and projected, can be studied and compared by means of the Level of Service Concept. Level of Service is defined as the composite effect of speed and travel time, traffic interruption, freedom to maneuver, safety, driving comfort and convenience, and operating costs. Six Levels of Service can be identified, ranging from excellent (A) to intolerable (F), which form a qualitative ranking of operating

conditions, and which can be applied separately to urban and rural roads. See FIGURE 1-3-5 for photographic illustrations of Levels A-F.

On two lane highways in rural areas, the following Levels of Service are a function of speed limits, passing sight distance, roadway geometrics and the physical makeup of the roadway.

- Level A Rural: free flow operation, with highway geometrics primarily affecting the speed limits; operating speeds are 55 mph or higher; approximately 75% of the desired passing maneuvers are made with little delay.

- Level B Rural: stable flow operation with increased traffic volumes controlling speed and passing maneuvers; operating speeds are 50 mph or more.

- Level C Rural: continues stable conditions with increased traffic volumes having a direct effect on operational speed, which is independent of the roadway alignment; operating speed for uninterrupted flow is 40 mph or higher.

- Level D Rural: unstable flow is approached as speeds drop to 35 mph due to traffic volumes; the capacity of the highway is approached for short periods of time without a high probability of breakdown in flow.

- Level E Rural: capacity is reached; operating speeds are in the neighborhood of 30 mph, but may vary considerably.

- Level F Rural: jammed traffic conditions prevail; operating speeds are below 30 mph; volumes are unpredictable.

In urbanized areas the following Levels of Service are a function of the intersection capacities along with the physical makeup of the roadway, parking conditions, peak hour traffic volumes, turning movements, truck and bus traffic, and traffic control measures.

- Level A Urban: free flow operation; driver is concerned only about the chance of being stopped at a red signal; otherwise, movement is unrestricted.

- Level B Urban: stable operation; many drivers begin to feel somewhat restricted with platoons of vehicles.

- Level C Urban: stable operation continues; occasionally, drivers may be detained by more than one complete signal cycle, and backups may occur behind turning vehicles; most drivers feel somewhat restrictd, but not objectionably so.

- Level D Urban: increasing restriction or approaching instability during peak fifteen minutes; frequently drivers may wait more than one complete signal cycle; individual delays may be substantial for short periods during the peak hours; however, recurring backups are not excessive and are cleared up during the lighter demand signal cycles.

- Level E Urban: volume equals capacity; represents the greatest moving volume an intersection can accommodate; drivers are faced with long queues and frequent delays.

- Level F Urban: jammed traffic conditions; traffic flow breaks down on more than one approach to an intersection; blockages occur often, preventing traffic movement on cross streets; traffic volumes are unpredictable; drives are faced with prolonged stop-and-go conditions.

The preferred Alternative 4-M-5 will provide Level of Service A at the projected traffic volumes, as determined by comparing the projections in FIGURE 1-3-4 with accepted criteria in the 1985 Highway Capacity Manual for determining Levels of Service. In the future, compared to the No Build Alternative, Relocated Route 44 (Alternative 4-M-5) will also improve the Level of Service at the existing intersection of Routes 44 and 58, as well as other intersections along existing Route 44, due to the fact that truck and other traffic will be diverted to the new highway. Consequently, traffic safety will be improved on existing Route 44. The residential area in the vicinity of the Halliday plant in Plympton will benefit from the Spring Street interchange, which will divert traffic now using local streets to reach regional roads.

SAFETY

FIGURE 1-3-2 compares the accident involvement rate for several segments of Route 44 to statewide average accident rates for roads classified as urban secondary two lane roads. The comparison is given for the years 1979, 1980 and 1893, the latest three years for which this information is available.

Accident involvement rate is defined as the number of accidents per million-vehicle-miles. It is valuable because variations in traffic volumes and roadway segment lengths are taken into account. This permits the relative performance along a section of a highway to be compared with statewide averages.

Accident involvement rates on existing Route 44 exceed the statewide average accident rates in all roadway segments, although it is noted that in 1983 there was improvement on the segment from Route 58 to the Plymouth Town line, and in 1980 and 1983 on the segment from the Plymouth town line to Seven Hills Road. However, of particular concern is the segment east of Seven Hills Road where the accident rate consistently exceeds the statewide average.

For motorists using Relocated Route 44, there will be significant safety improvements. Accident rates on Relocated Route 44 should correspond to average accident rates for full access controlled primary highways. The 1983 average accident rate for a four lane divided highway in urban areas was 3.36 accidents per million vehicle miles, and 3.20 accidents per million vehicle miles in rural areas, as furnished by the Massachusetts Department of Public Works. The accident rates on existing Route 44 and other area Routes can also be expected to decrease due to diversion of some of the traffic to relocated Route 44.

FIGURE 1-3-1

INTERSECTION LEVEL OF SERVICE ANALYSIS

	Level of Service		
		Year 2000 Peak Hours	
	1977 Peak Hr. System	No Build	Relocated Route 44
1. Rel. Rt. 44 and Route 58			
a. Existing at-grade intersection	B	D	--
b. New Interchange ramps	--	--	D C*
2. Rel. Rte. 44 and Rel. Spring St.			
a. Interchange ramps	--	--	A
3. Rel. Rte. 44 and Connector Rd.			
a. Interchange ramps	--	--	B
4. Route 3 and Cherry St./Rel. 44			
a. Existing interchange ramps	A	A	--
b. Trumpet interchange (link cap.)	--	--	B
5. Route 3 and Samoset St.			
a. Existing interchange	F E*	F* E**	F* E**
b. Modified interchange	--	--	D**
6. Exist. 44 and Seven Hills Rd.	C*	D*	C*
7. Exist. 44 and Route 80	C	F C*	E C*
8. Exist. 44 and Route 58	C*	F* D**	D C*

*2 lane width on heavier traffic volume roadway approach
**2 lane width on both roadway approaches

Note: Levels of Service without asterisk(s) signify a single lane approach to an intersection.

FIGURE 1-3-2

ACCIDENT INVOLVEMENT RATE

		1979			1980			1983			STATEWIDE AVERAGE		
ROADWAY SEGMENT	Length (Miles)	Annual Volume (MV)	No. Acci-dents	Acc. Inv. Rate (Acc/MVM)	Annual Volume (MV)	No. Acci-dents	Acc. Inv. Rate (Acc./MVM)	Annual Volume (MV)	No. Acci-dents	Acc. Inv. Rate (Acc./MVM)	1979	1980	1983
Route 44/Carver (Route 58 to Plymouth Line)	3.47	2.07	10	<u>4.83</u>	2.18	15	<u>6.88</u>	2.51	9	3.59	4.44	4.94	4.93
Route 44/Plymouth (Carver Line to Seven Hills Road)	2.93	3.29	21	<u>6.38</u>	3.47	15	4.32	4.00	17	4.25	4.44	4.94	4.93
Route 44/Plymouth (Seven Hills Road to Route 3A)	1.88	6.88	73	<u>10.61</u>	7.25	49	<u>6.76</u>	8.36	43	<u>5.14</u>	4.44	4.94	4.93

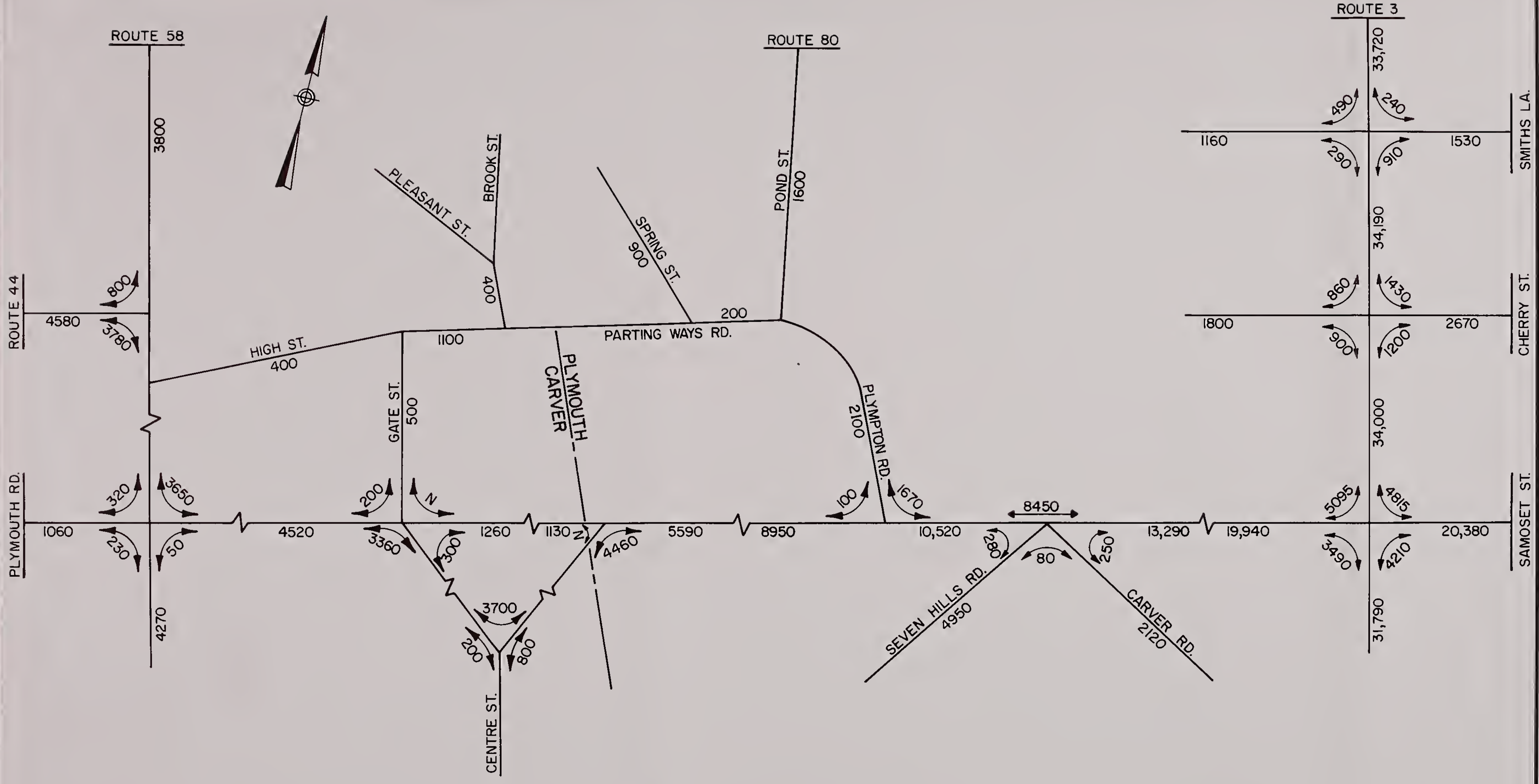
Date Source: Massachusetts Department of Public Works

(Underlined numbers exceed statewide average)

RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH
MASSACHUSETTS

1977 TRAFFIC VOLUMES
EXISTING ROADWAY SYSTEM



DESIGN FACTORS:
K = 10 to 12%
D = 60 to 70%
T_{AD}= 3 to 9%
T_{PH}= 2 to 6%

LEGEND:
1234-1977 AVERAGE DAILY TRAFFIC VOLUME (ADT)

NO SCALE

FIGURE 1-3-3

RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

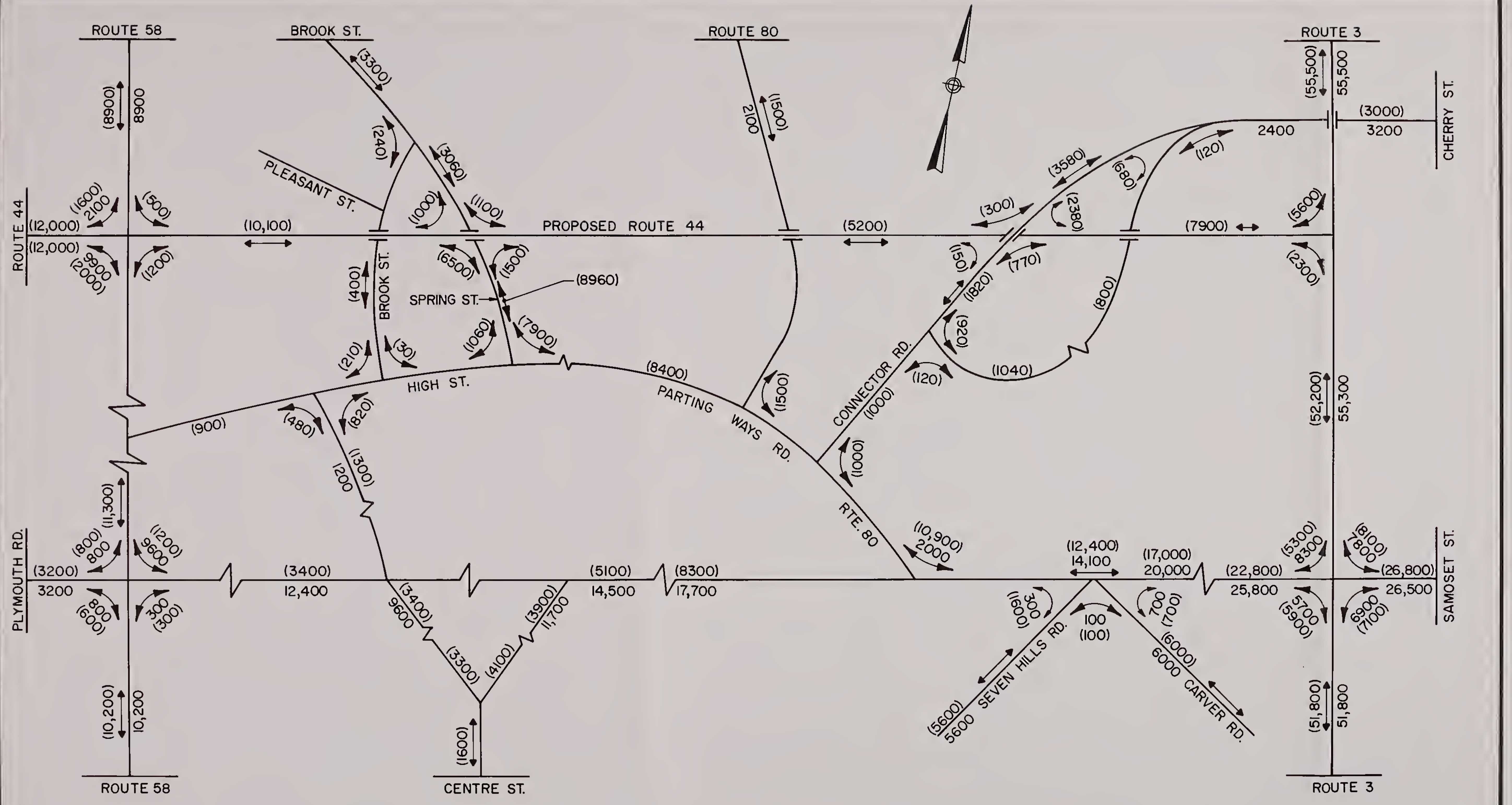
MASSACHUSETTS

YEAR 2000 TRAFFIC VOLUMES

RECOMMENDED ALTERNATIVE

AND

NO-BUILD ALTERNATIVE



ROUTE 44

DESIGN FACTORS:

K	=	15 %
D	=	65 %
T_{AD}	=	9 %
T_{PH}	=	1 %

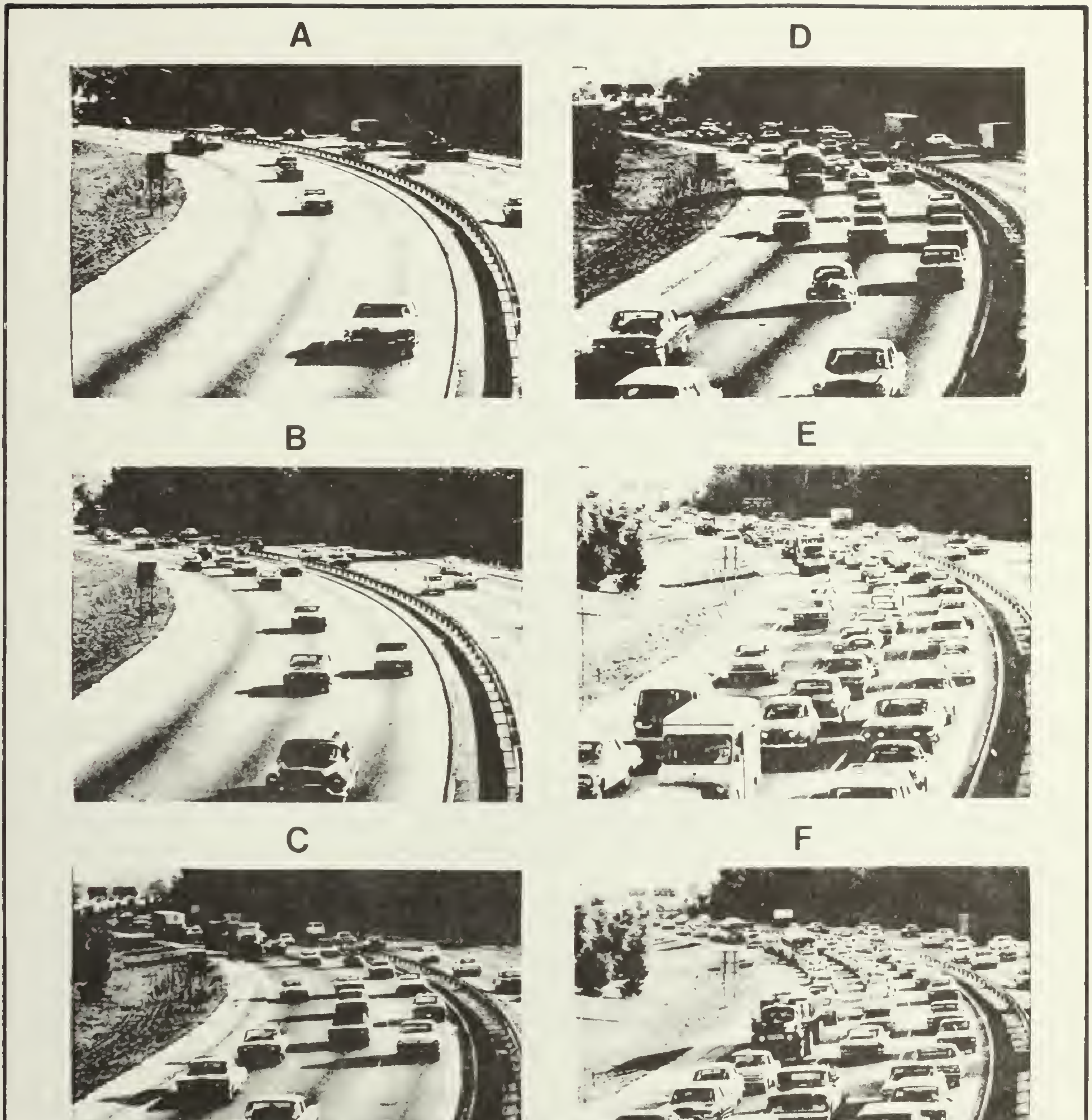
LEGEND

XXX - 2000 NO-BUILD ALT.

(XXX) - 2000 ADT RECOM. ALT.

NO SCALE

FIGURE 1-3-4



LEVEL OF SERVICE CONCEPT

FIGURE 1-3-5

SECTION 2

ALTERNATIVES INCLUDING PROPOSED ACTION

1. IDENTIFICATION OF ALTERNATIVES

Three courses of action were identified with respect to Route 44, within which eight Alternatives were studied. These options were 1) to see what can be done about Route 44 in its present alignment; 2) to relocate it partially and utilize a portion of the existing roadway; 3) to relocate it entirely.

No Route Relocation:	Alternative 1:	No Build
	Alternative 2:	Upgrade Existing Route
Partial Route Relocation:	Alternative 3:	Partial Build: Corridors 3-E and 3-W
Full Route Relocation:	Alternative 4:	Corridor 4-L
	Alternative 5:	Corridor 4-M
	Alternative 6:	Corridor 4-M-1
	Alternative 7:	Corridor 4-N
	Alternative 8:	Corridor 4-M-5

2. CORRIDOR DETERMINANTS

There were two criteria which governed the choice and evaluation of Alternatives; first, general objectives as described in Section 1; and second, the physical and other determinants in the study area.

The existing pattern of land use necessitated finding a corridor which while meeting these general objectives, could weave its way with minimized impacts among the various land commitments between Routes 58 and 3. All the land in that area is committed in one way or another, to public and institutional ownership, as cranberry bogs, housing developments and neighborhoods, historic sites both existing and potential, to topography, water and other land features. Consequently such a corridor of necessity had to be a compromise.

The land commitments shown in MAP 2-A demonstrate how they acted as determinants. The western end of a relocated Route 44 is established by the point where it now intersects with Route 58 in Carver; the eastern end is that point on Route 3 where it can most directly serve the center of Plymouth, which is not only a focal point of historic interest, but also of growing regional importance for commerce, industry and housing.

The most obvious place for Route 44 to connect with Route 3 is the present interchange of those two roads. But one of the basic reasons why Route 44 is under study for relocation is also why a new, limited access road could not feasibly do that: the density of development is too great. Route 44 in Plymouth has become in effect, an urban street and therefore can no longer function as a regional highway. Perhaps the most serious problem with present

Route 44 is that it is serving as both, and that is not desirable for the present, let alone for the foreseeable future. Furthermore, the density of development east of Route 3 is even greater than west of it, so that even today, Route 44 extends to Route 3A in name only. For all practical purposes, a relocated Route 44 does and will terminate at Route 3.

The area south of existing Route 44 in Plymouth has been developed so intensively and its landscape has so many large water bodies that a corridor through it is effectively precluded. Having ruled out present Route 44 and the area to its south, there remains only the area to its north, which while not without limitations, presents relatively fewer problems. In order to maintain highway design standards along Route 3, a new Route 44 must intersect it at an existing interchange such as Cherry Street in Plymouth or Smith's Lane in Kingston. An interchange between those two, or between Cherry Street and present Route 44, is not possible for the following reason. The distance between the Smith's Lane and Cherry Street interchanges is about one mile. If relocated Route 44 were to connect with Route 3 between those two points, there would be less than 1/2 mile weaving distance between them. The same facts apply to the Cherry Street/Samoset Street combination.

As mentioned above, scattered through the countryside between Route 58 and Route 3, north of existing Route 44, there are many cranberry bogs, swamps, wetlands, brooks and ponds; residential development which generally parallels existing roads, but is clustered in a large neighborhood between Plympton Road and Route 44 in Plymouth; large tracts owned by the Boy Scouts of America, the Sisters of Divine Providence, the Towns of Plymouth and Kingston, and the Commonwealth of Massachusetts; existing and potential historical sites; and other important physical features such as Monks Hill, and existing and potential sites for municipal water supplies.

It is impossible to locate a corridor in that area which meets the applicable geometric design criteria, without affecting one or more of these physical conditions or ownerships. A brief description of the corridors will attest further to that basic fact. Starting at Route 58, any possible corridor must aim in a northeasterly direction in order to avoid crossing Rickett's Pond, Cedar Swamp in Carver, and the Boy Scout Camp which is partly in Kingston and partly in Plymouth, and the neighborhood in Plymouth referred to above. These major land uses establish the line of the most southerly of all the corridors. Alternative 4-L (see MAP 2-B) does not altogether miss them, while staying about 1/4 mile south of the Sacred Heart High School and unavoidably going through a portion of Parting Ways Cemetery before reaching the Cherry Street interchange.

The land owned by the Sisters of Divine Providence is so large that the next possible corridor is that taken by corridor 4-M, skirting the northerly edge of Muddy Pond, but not without cutting off corners of the Kingston State Forest, the Sisters' land, and Camp Nekon in Kingston. Corridor 4-M-1 is a variation of 4-M which goes to the north of Rickett's Pond; in doing so, it avoids some of the effects of 4-M, but creates new ones in their place. Corridor 4-N is the most northerly of the corridors, and the only one to use the Smith's Lane interchange. The direction of this corridor was determined by trying to avoid the State Forest, as well as other land of the Town of Kingston. The preferred Alternative 4-M-5 is a variation of 4-M-1 and is, in effect, a compromise which satisfies the several objectives and minimized impacts among the land uses it must affect.

The following list summarizes the major land use factors which influenced the choice of corridors, and particularly the choice of the preferred Alternative, 4-M-5.

1. The location of the previously completed single barrel of Route 44 relocation to the west of Route 58 in Carver.

2. The location of Cole's Mill, a historic site located north of High Street in Carver.

3. The residential neighborhoods in Carver in the vicinity of Pleasant and Brook Streets, and in the vicinity of Spring and High Streets.

4. The location of the Halliday Plant and a historic building on Spring Street south of the Halliday Plant in Carver.

5. Rickett's Pond in Carver and Trackle, Wolf, Muddy and Pratt Ponds in Kingston.

6. Potential well sites for Kingston in the vicinity of Trackle Pond.

7. Kingston State Forest.

8. Camp Nekon in Kingston.

9. Property of the Sisters of Divine Providence, including schools, convent and girls camp.

10. Monks Hill and its lookout tower in Kingston.

11. Plymouth Industrial Park and industrial property along Cherry Street in Plymouth.

12. The location of the existing Cherry Street Interchange with Route 3.

13. Numerous wetlands and cranberry bogs throughout the study area.

3. DESCRIPTION OF ALTERNATIVES AND THEIR LIKELY IMPACTS

ALTERNATIVE 1: NO BUILD

DESCRIPTION

Alternative 1 proposed that the present roadway geometrics of Route 44 remain as they are; that is, a 20' - 24' pavement width with poorly defined shoulders and no sidewalks, except for a one mile section in Plymouth. The right of way width of 41.25' (2.5 rods) dates from 1853. Route 44 now serves as a local collector road and as a regional arterial, but its narrow width does not serve these functions adequately. The accident rate on the easternmost segment of Route 44 consistently has exceeded the statewide average.

This alternative was therefore rejected because as through and tourist traffic increase and as the region, particularly Plymouth, becomes more developed, congestion on Route 44 will become still more aggravated.

Implementation of this alternative would have required increasing control of traffic flow by local police and the use of local streets to bypass congested intersections during peak periods, except for trucks. The disjointed connection between the east and west sections of Route 44 along Route 58 in Carver would not have been improved.

LIKELY IMPACTS

RELOCATION

The No Build Alternative would have had no impact insofar as relocation is concerned.

ECONOMIC

Economic development would not have been advanced by Alternative 1. It would not have provided ready access to industrial areas in Plympton, Kingston and Plymouth, nor would it have relieved traffic sufficiently to make the region more attractive to potential developers of industrial parcels. In fact, the reverse is more likely: as an unimproved Route 44 becomes more congested, it would be less attractive to businesses requiring direct and unencumbered access.

LAND USE

Route 44 would continue to serve as a regional arterial and local collector road if this Alternative were to have been selected. Commercial and residential uses would continue to develop in the area tributary to Route 44, thereby increasing traffic on a road hardly able to carry existing volumes. This factor was taken into account in the related traffic projections.

NATURAL FEATURES

This Alternative would not have affected topography, or any other natural features.

WETLANDS AND WATER RESOURCES

This Alternative would have imposed no additional effects on wetlands and flood-prone areas, nor on surface and groundwater resources.

NOISE

The projected increase of traffic on existing Route 44 would have increased noise levels in several locations, two of which would have exceeded FHWA noise abatement criteria. Noise would have affected 270 houses, 3 churches and 2 motels. Noise levels along existing Route 44 would have continued to be high even after a new road was built, although some decrease might have been anticipated as truck traffic was diverted.

AIR QUALITY

This alternative would have had the most adverse affect on ambient air quality of all the Alternatives.

4(f)

No effect.

HISTORICAL/ARCHAEOLOGICAL

No effect.

FARMLANDS

No effect.

ALTERNATIVE 2: UPGRADE EXISTING ROUTE

DESCRIPTION

The Second Alternative was to improve existing Route 44 in its present alignment; that is, widen it throughout its entire length.

Traffic volumes vary along the route. Consequently, the typical section in Carver was assumed to be a rural two lane highway, with a minimum right of way 46' wide, and providing two 12' travel lanes, minimum 6' shoulder widths, with 5' berms for installation of a guard rail where needed, and the typical section in plymouth was assumed to be a restricted right of way at least 72' and provides four 12' lanes, 2' offsets at the curbs, and 10' berms for future sidewalks or bikepaths. Additional widening would have been required for special truck lanes and/or islands. Other improvements would have included traffic signals, signs, lighting and pavement markings.

This Alternative was rejected, primarily because of the very severe effect such widenings would have had on properties abutting Route 44. It would have necessitated severances of land, and the elimination of driveways and front yards. Although an initial improvement in operating speeds could have been expected, increasing volumes of traffic would eventually reduce those speeds to current conditions.

Widening of the southern edge of the roadway in Plymouth, near Route 3, would have required special attention to the Algonquin Gas Transmission Company's 50' easement which contains a 4" and an 8" high pressure gas-lines. This Alternative would not have provided ready access to the industrial areas in Plympton, Kingston or Plymouth. In order for it to be most effective, frontage roads would have to have been provided in business districts, in order to help channelize turning movements. The disjointed connection between the east and west sections of Route 44 along Route 58 in Carver would not have been improved.

LIKELY IMPACTS

RELOCATION

Alternative 2 would have had no impact insofar as relocation is concerned, although there would have been many severances of properties fronting on existing Route 44.

ECONOMIC

Economic development would not have been advanced by Alternative 2, for the same reasons as stated for Alternative 1. Industrial areas would not have been served directly.

LAND USE

The widening of existing Route 44 would have had an immediate impact on the houses and businesses which abut it--the severance of front yards, driveways and parking areas. The net effect would have been to make the residential properties less desirable, with the further likelihood of decreasing values which could have triggered a movement to convert this frontage to commercial use.

NATURAL FEATURES

No major cut or fill was projected. Wildlife habitats, principally those of birds, would have been modified where the forest edge was moved back, but only in a very limited section of the highway.

WETLANDS AND WATER RESOURCES

Impacts to the following wetlands would have occurred entirely in Carver north of existing Route 44. At Shurtleff Corner and about 3,000' west of this intersection, a small portion of a cranberry bog and wooded swamp, respectively, would have been lost; and other losses were likely to have occurred approximately 3,000' west of the Carver/Plympton town line where a cranberry bog is located along the north side of existing Route 44, and in a shrub swamp south of Darby Pond.

Flood-related impacts to these sites were expected to be similar to those outlined for wetlands, due to the fact that a portion of each of the above wetland communities is also a flood-prone area.

Although the upgrading of Route 44 would have resulted in some short-term, construction-related impacts to surface water, there would also have been long-term impacts, primarily increased levels of roadway-generated contaminants in the surface water bodies. The projected increase of traffic, especially in Plymouth, would not have increased roadside contaminants such as iron, lead, nickel, and other materials to any significant degree above present levels. Nutrient levels would also have remained at levels similar to those found during the monitoring in September 1977.

Projected increases in chloride concentrations along this Alternative were examined at Darby Pond and Narragansett Pond. The potential increases were likely to have had little beneficial or detrimental effect on the pond's aquatic flora and fauna. Groundwater impacts associated with road salting were likely to have been confined to existing domestic wells close to Route 44 between the Plymouth-Carver town line and Route 3.

AIR QUALITY

No adverse effects.

4 (f)

No effect.

HISTORICAL/ARCHAEOLOGICAL

No effect.

FARMLANDS

No effect.

NOISE

Noise increases would have occurred at 270 houses, 3 churches and 2 motels. At three locations noise levels would have exceeded the FHWA noise abatement criteria.

ALTERNATIVE 3: PARTIAL BUILD: CORRIDORS 3-E AND 3-W

DESCRIPTION

A third option was to relocate Route 44 partially so as to rectify at minimal cost some of the problems raised by Alternative 2, particularly the effect on abutting properties. Corridors 3-E and 3-W were developed to achieve that limited objective. Existing Route 44 would have been widened between these two Corridors. See MAP 2-B.

The cross section of widened Route 44 would have been the same as in Alternative 2—a 72 foot right of way, permitting four 12' lanes. Alternative 3 would therefore have resulted in a new two lane section of Route 44 from Route 58 eastward to a point where it would have merged with Plymouth Road in Carver and Plymouth to the point where it merges with Wenham Road; followed by nearly two miles of a widened existing Route 44 with two to four lanes, depending on traffic projections; and finally another new section of two lanes (3-E), to the interchange with Route 3 at Cherry Street. The entire length of the resulting Route 44 would have been .9 miles shorter than the existing Route 44.

Corridor 3-W would have affected Cole's Mill, a site of historical significance and potentially eligible for the National Register, to the point where its grade was controlled by the hydraulic considerations involved in crossing the Winnetuxet River, as well as by the alignment

necessary to merge with Plymouth Road in East Carver and to avoid extensive areas of cranberry bogs. When crossing the area bounded by the Winnetuxet River on the west and Doten Brook on the east, a closed drainage system would have been used to reduce the discharge of runoff. Doten Brook would have been relocated south of the roadway, thereby avoiding the need to cross it.

Corridor 3-E was intended to relieve congestion on the section of Route 44 where traffic volumes are highest, without any residential or business displacement. It was proposed to begin about 2,000' west of the intersection of Routes 44 and 80, heading toward a new interchange with Route 80 and then curving northeasterly to the Cherry Street interchange at Route 3. An 1,800' section of the roadway would have had a 3% grade in order to minimize cut sections; consequently a truck climbing lane in the eastbound direction would have been required.

This Alternative was rejected because it was only a partial solution. The widened section between 3-E and 3-W would have had the same problems as Alternative 2 with respect to existing properties. Other negative factors are mentioned in the following likely impacts.

The 1978 estimated cost for Alternative 3-E/3-W was $16,010,000. The 1984 estimated cost, projecting the 1978 cost by using the Annual Price Trend for Federal-Aid Highway Construction-1977 Base, is $27,200,000.

LIKELY IMPACTS

RELOCATION

Six single family, owner-occupied housed in Carver would have had to be acquired for Corridor 3-W. No difficulty was anticipated in relocation, because of the very active housing market in Carver.

Corridor 3-W would not have divided the community insofar as neighborhoods or community facilities were concerned. It would not have displaced any businesses, but several cranberry bogs would have been affected.

Corridor 3-E did not affect any houses. It traversed undeveloped areas throughout its length and would not have been disruptive to the community.

ECONOMIC

Alternative 3 would have lived up to its title of "partial" insofar as economic development is concerned. Its use of two new sections with the upgraded old route in the middle, would have been a token approach, although its terminus at the Cherry Street interchange would have permitted direct access to the Plymouth Industrial Park.

LAND USE

It is not likely that the 3-W section of this Alternative would have changed land use because the area involved is basically wetlands and cranberry bogs, as encouraged by local zoning. The

3-E section was more likely to have stimulated new development, or rather, to hasten what has already been foreseen by local zoning and planning. The triangular area formed by Routes 80 and 44 in Plymouth has been zoned for commercial use, and a small shopping center is contemplated. Corridor 3-E would have cut through this area, thereby providing the bulk of the site with frontage and/or visibility on three main roads. Furthermore, the alignment of 3-E approximates the line dividing the industrial zone which includes the Plymouth Industrial Park from a large mixed-density residential zone bordering on existing Route 44. The Corridor of 3-E would in all likelihood have become the new dividing line, acting as a buffer between these two major land uses.

NATURAL FEATURES

Corridor 3-E would have impacted topography and soils in several areas of cut which range from ten to forty feet in height. Measures to prevent soil erosion would have been required. A stand of small softwoods would have been removed in the vicinity of the power transmission line, but unique or large forest types were not affected.

Corridor 3-W crossed four cranberry bogs and wetland areas associated with the Winnetuxet River and Doten Brook. Five to ten feet of fill would have been needed for embankments whose side slopes would have required vegetative stabilization to maintain water quality.

WETLANDS AND WATER RESOURCES

Impacts to wetlands would have occurred entirely in Carver, where a total of about 30 acres of wetland habitat would have been lost. Along Doten Brook in particular, areas of wooded and shrub swamp, as well as portions of several cranberry bogs would have been filed or removed. Construction of the 3-W portion of the Alternative would have resulted in the loss of approximately 16 acres of wooded swamp, 7 acres of shrub swamp, 6 acres of cranberry bog, and 1 acre of shallow marsh. Construction of the 3-E portion would have meant the loss of about 4 wetland acres, the majority of which were abandoned cranberry bogs.

Because the wetlands associated with Doten Brook are also flood-prone areas, the removal of vegetation and filling would have reduced the capacity of wetlands to store water and control floods. An additional flood-prone area affected by this Alternative included the wooded swamp associated with the headwaters of the Winnetuxet River.

This Alternative would have had varying impacts on groundwater and surface water resources ranging from slight to potentially very significant. The western segment of Alternative 3 posed no problems to any municipal wells, due to the fact that Carver currently has none. If in the future, however, Carver should decide to install municipal wells, the construction of this Alternative would probably restrict a portion of North Carver for such purposes. Domestic wells would be essentially unaffected by

the roadway beyond about 200' from the road surface, up gradient from the highway. Wells which may be situated down gradient from the highway would experience an increase in chloride levels from road salts.

Corridor 3-E, in one section, would have approached within 1000', up gradient, of the Plymouth Town Well north of Triangle Pond, the closest which any of the build Alternatives passed to an existing municipal well location. Impacts to this well from roadway contaminants, especially chlorides were likely to have been significant. Contaminants generated by traffic increases in the western portion of Corridor 3-W would eventually have been transported through runoff and subsurface flow into the Winnetuxet River.

NOISE

111 houses would have an increase in noise from this Alternative. The projected increase of traffic on existing Route 44 would have increased noise levels on several locations, two of which would have exceeded FHWA criteria, and another would have been a severe impact for being 15 dBA greater than the existing level.

AIR QUALITY

No negative effects.

4(f)

No effect.

HISTORICAL/ARCHAEOLOGICAL

See discussion above of Cole's Mill under Description.

FARMLANDS

Four cranberry bogs totalling six acres would have been lost in Corridor 3-W. Corridor 3-E would have resulted in the loss of about 3 acres of abandoned cranberry bogs.

ALTERNATIVE 4: CORRIDOR 4-L

DESCRIPTION

Corridor 4-L was the most southerly of the four Alternatives involving a completely relocated highway. See MAP 2-B. Beginning at the interchange of Route 58 and new Route 44 in Carver, it headed in a more or less easterly direction north of and roughly parallel to High Street for its first two miles. It then crossed High Street and continued almost due easterly just south of High Street along the northern edge of Cedar Swamp in Carver. Approximately paralleling Parting Ways Road (the extension of High Street), 4-L cut through the southernmost corner of Kingston for less than a mile and upon crossing into Plymouth swung to the northeast and roughly paralleled the Kingston-Plymouth Town line to the Cherry

Street interchange at Route 3. It cut across the northern part of Camp Norse which belongs to the Boy Scouts of America, and through Parting Ways Cemetery, about 1/4 mile south of Sacred Heart High School.

An interchange at Brook and Pleasant Streets would have provided access to the Halliday plant and Plympton Industrial Park via Brook and Spring Streets. Pleasant Street would have been dead-ended north of the Corridor and realigned through Nel Bonney Road to join Brook Street close to Plympton/Carver town line. This interchange was intended to provide access to the Halliday plant on Spring Street in Plympton, and while such an arrangement would have been better than the present situation, it would still have required Halliday traffic to use Spring and Brook Streets in residential areas to reach the interchange.

A new one mile segment of Route 80 would have been built, from a point just south of the private road that leads into Camp Mishannock to a point close to the entrance to the West Elementary School, with an interchange where 4-L crossed the new Route 80. Direct access to the Plymouth Industrial Park would have been provided via an interchange connecting with Industrial Park Road, as described below. Direct access to the Kingston Industrial Park was possible, but such a connection is not within the scope of the Route 44 project.

The proposed Cherry Street interchange, which was common to Alternatives 4, 5 and 6 (as well as the preferred Alternative 4-M-5), had two sections: a revised interchange at Route 3; and a completely new interchange about 3/4 mile west of Route 3, connecting Route 44 with Nick's Rock Road to the north and Industrial Park Road to the south. Through traffic would use the former, local traffic the latter. Traffic headed for the center of Plymouth would be directed to Route 3 and thence to its interchange with existing Route 44. Improvements to that interchange as well as to Route 3 itself between that interchange and the one at Cherry Street were also planned. These improvements and routing apply to all Alternatives.

As noted above, this alternative would have affected a portion of the Boy Scouts' Camp Norse. Moreover, it would have cut through Parting Ways Cemetery, an important historic site, not on the National Register of Historic Places. Although there would have been an interchange serving the Halliday plant and the nearby industrial zone in Plympton, its location was sufficiently removed from them that local streets in Carver would have been affected by increased traffic. For these reasons, Alternative 4-L was rejected.

The 1978 estimated cost for Alternative 4-L was $30,383,000. The 1984 estimated cost, projecting the 1978 cost by using the Annual Price Trend for Federal-Aid Highway Construction-1977 Base, is $51,680,000.

LIKELY IMPACTS

RELOCATION

Five single family, owner-occupied houses in Carver would have had to be acquired for Alternative 4-L, but no structures were affected in Kingston or Plymouth. Relocation did not appear to be a problem because of the very active housing market in Carver.

The affected houses in Carver were located where Alternative 4-L crossed existing streets; otherwise, the Corridor generally traversed undeveloped land and would therefore would not have been disruptive of community development patterns in Carver, Kingston or Plymouth.

ECONOMIC

Alternative 4-L would not have served the Plympton industrial area directly, but it would have done so for the Plymouth Industrial Park. It would have provided an interchange at Brook Street, which would not have served the Halliday plant as directly as an interchange at Spring Street. Traffic to and from Halliday would have had to use local streets in Plympton for about a mile.

LAND USE

Corridor 4-L would have affected the northern section of Camp Norse (Boy Scouts of America). Although a simple structure across Route 44 would have permitted continued access into the heart of the Camp at Darby Pond, there would have been an effective discontinuance between that section and the northern part, which contains approximately 20 acres fronting on Parting Ways Road.

NATURAL FEATURES

From Route 58 eastward, Corridor 4-L would have crossed five cranberry bogs, as well as wetlands associated with the Winnetuxet River, and then two lobes of cedar swamp. It is likely that some cedars would have been lost as a result, but otherwise, damage to vegetation would have been slight.

Preliminary profiles indicated that highway fill sections would have varied from five to thirty feet above the level of these water bodies; an area of 30' fill extended for approximately 2,000' roughly parallel with High Street. Three cranberry bogs would have been affected. Timely vegetative cover would have been needed to minimize soil erosion which would have had an immediate effect on wetland water quality. In the vicinity of Parting Ways Cemetery, a 25 foot fill was required.

WETLANDS AND WATER RESOURCES

Alternative 4-L would have affected a number of wetland types primarily in the western portion of Carver. A portion of a wooded swamp in the headwaters of the Winnetuxet River would have been affected by 4-L along with cranberry bogs in the vicinity of Cole's Mill. Further to the east, several wooded swamp areas in the northern end of Cedar Swamp would have been affected, including potential flooding. In its extreme eastern end, near Cherry Street, several cranberry bogs would have been affected. About 39 acres of wetlands would have been affected, of which 21 acres were wooded swamps, including Cedar Swamp, the wetland along High Street, and wooded swamps associated with the headwaters of the Winnetuxet River.

Alternative 4-L would have impacted no municipal wells between Route 58 and Cedar Swamp, but between Cedar Swamp and Plymouth a greater potential existed for more significant impacts to groundwater because of the Plymouth aquifer. Alternatives 4, 5, 6 and 7, as well as the preferred 4-M-5, all have this problem in common. It has been resolved by a closed drainage system for the entire length of the relocated highway. The Plymouth municipal well was to have been located down gradient of the proposed roadway, and its zone of influence would have been crossed. This site has been considered suitable for the construction of an additional municipal well.

Along the proposed roadway, especially near the western end, are located numerous residences which rely on individual wells for their water supply. It would have been necessary to cap or relocate some of these wells which would be down gradient of the roadway. Impacts to surface water bodies along Alternative 4-L would have been slight. An exception to this would have been a small pond north of Plympton Street in Plymouth which would have been reduced to approximately 50% of its present size. Salting impacts to this pond would have been significant.

NOISE

Eighteen houses would have had a noise increase by this Alternative. At two locations, the increase in noise would have been greater than 15 dBA, which is considered a severe impact.

AIR QUALITY

No adverse effects.

4(f)

Parting Ways Cemetery would have been affected. This Cemetery, now on the National Register of Historic Places, in historically and archaeologically important as the site of a land grant made by the Town of Plymouth to four freed blacks in recognition of their service in the American Revolution.

HISTORICAL/ARCHAEOLOGICAL

Parting Ways Cemetery, listed on the National Register of Historic Places, would have been affected. This Corridor would also have affected a portion of the Annasnappet Archaeological District. Refer to Sections 3-2 and 4-6.

FARMLANDS

Five cranberry bogs totalling 10 acres would have been affected. However, this is a characteristic common to Alternatives 4, 5, 6, and 7, as well as the preferred 4-M-5, and its resolution would apply to all.

ALTERNATIVE 5: CORRIDOR 4-M

DESCRIPTION

Corridor 4-M coincided with 4-L for about the first 2 1/2 miles, up to the intersection of Spring and High Streets in Carver. At that point 4-M swung to the northeast heading for the northern edge of Muddy Pond in Kingston. It then formed an arc around the Pond, using the southern boundary of the Kingston State Forest and Kingston's Camp Nekon as a point of tangency. It then headed southeast and again northeast to the Cherry Street interchange, coinciding with the 4-L Corridor for the final leg of a little more than 1/2 mile before Route 3. Corridor 4-M was, in effect, a mirror image of 4-L, the former going to the north of the large property owned by the Sisters of Divine Providence, the latter to the south, as demonstrated on MAP 2-B.

The direction of 4-M in the vicinity of Muddy Pond illustrates the problems and compromises involved in weaving a route location among sensitive land uses and ownerships: the more the Corridor stayed to the north of Muddy Pond, the more it intruded upon the State Forest, Camp Nekon and Monk's Hill. As shown on MAP 2-B, 4-M would have been about 1/4 mile from the swimming area and cabins of Camp Mishannock, which is operated by the aforementioned Sisters.

This Corridor was 6.63 miles long from Route 58 to Route 3. Vertical controls for 4-M were required to reduce earthwork in general and the impact on the edge of Cedar Swamp in particular; to minimize its visual relationship with Camp Mishannock; to blend into the landscape wherever possible and especially south of Monk's Hill; and to minimize excessive cut and fill.

The interchanges at Brook Street and Industrial Park Road, as discussed for Alternative 4-L, also applied to this Alternative. Although it would also have had an interchange with Route 80, there would have been no need to construct a new section of that road as proposed for Alternative 4-L.

Alternative 4-M was rejected for one of the same reasons as was 4-L; the interchange to serve the industrial area in Plympton would have been too distant (about a mile), and would therefore have affected local residential streets in Carver. It would have required the acquisition of 12 single family houses, the largest number of any of the alternatives. It also proposed an interchange at Route 80, which as explained under Alternative 4-M-1, was unacceptable to the Sisters of Divine Providence. It was located too close to the habitat of the white bracted boneset, a State rare and endangered species.

The 1978 estimated cost for Alternative 4-M was $28,950,000. The 1984 estimated cost, projecting the 1978 cost by using the Annual Price Trend for Federal-Aid Highway Construction-1977 Base, is $49,130,000.

LIKELY IMPACTS

RELOCATION

Due to the fact that Alternatives 4-L and 4-M coincided for their first 2 1/2 miles east of Route 58, the relocation impact for 4-M

would have been the same as for 4-L, namely 5 single family houses. In addition, 4-M would have affected seven 2 or 3 bedroom, single family houses in Carver due to the proposed relocation of High Street immediately south of Ricketts Pond. In view of the very active housing market in Carver, the added workload would have presented no difficulties.

Once Alternative 4-M left the Ricketts Pond area in Carver, it ran through undeveloped wooded areas in Kingston and Plymouth with no further displacement and no effect on development patterns, because most of the land is in public ownership.

ECONOMIC

Alternative 5 would not have served the Plympton industrial area, but it would have served the Industrial Park in Plymouth. Although it would have provided an interchange for the Halliday Lithograph Company at High Street, southeast of Ricketts Pond near the Carver/Plymouth line, it would have been about one mile from Halliday through local streets. A connection to the industrial area in Kingston was possible, but such a connection is not within the scope of this project.

LAND USE

A significant aspect of Corridor 4-M is that it would have isolated about 64 acres of the property of the Sisters of Divine Providence (out of a total of 660 acres) as well as taken an additional 74 acres in the right-of-way. It would also have required acquisition of about 3 acres from the Kingston State Forest and about 4 1/2 acres from Camp Nekon, the former Girl Scout camp and now belonging to the Town of Kingston. On the positive side, nearly all of the isolated 64 acres of the Sisters' land could have remained in open space through agreements among the agencies and institutions involved.

NATURAL FEATURES

From Route 58 eastward, Corridor 4-M would have crossed five cranberry bogs as well as wetlands associated with the Winnetuxet River, and then a portion of the northern part of Cedar Swamp.

From Cedar Swamp to Muddy Pond, 4-M involved very minimal cut and fill in balanced amounts, and consequently would have had little impact on topography and soils. As the Corridor passed around the northern edge of Muddy Pond, it crossed a wetland where approximately 25' of fill would have been required. Immediately thereafter, the Corridor passed along the side of a hill, where terracing the traffic lanes would have minimized the effects of cut, but revegetation of the side slopes would have been necessary.

The most serious impact was that this alignment would have come very close to an area along the northern shores of Muddy Pond where is found 60% of the world's population of the white bracted boneset, a species of plant considered to be rare and endangered by the Mass. Heritage Foundation.

WETLANDS AND WATER RESOURCES

The 4-M Corridor would have resulted in the loss of approximately 34 acres of various wetland communities, most of them in Carver. Active cranberry bogs were the most severely impacted wetland type, with an estimated loss of 16 acres.

There was a potential well site for Kingston east of Trackle Pond within 800' of this Corridor, situated down gradient from the proposed roadway. Such a well would have been significantly influenced by highway runoff, noticeably chlorides from road salts. The closed drainage system proposed for the preferred Alternative 4-M-5 would of course have eliminated this problem for 4-M-1 and the other rejected relocations of Route 44. A large road cut was proposed near the Kingston/Plymouth town line which at a maximum would have required cuts in excess of 70', with the potential for altering groundwater flow directions and recharge patterns.

Projected traffic volumes in the vicinity of Muddy Pond were used to estimate the potential levels of traffic related pollutants which could have affected the Pond. The calculations indicated slight increases in iron and chemical oxygen demand, and same in chloride levels. These increases were not of the magnitude which could have been injurious to aquatic flora nd fauna. It is likely that chloride increases would also have been detected in Great Mink Hole and Pratt Pond.

NOISE

Twenty-three houses would have had noise increase by this Alternative. The increase in noise would have been greater than 15 dBA in two locations, which is considered a severe impact.

AIR QUALITY

No adverse effects.

4(f)

Alternative 4-M would have required the acquisition of 3.1 acres from the Kingston State Forest and 4.6 acres from Camp Nekon, a former Girl Scouts Camp now owned by the Town of Kingston as a recreation area. Similar acquisitions, but with different acreages, is common to the other Alternatives, 4-M-1, 4-N, and the preferred 4-M-5. The method of mitigation is the same in each case, also. These Alternatives would also result in the acquisition and/or isolation of land from the Sisters of Divine Providence, a teaching order of nuns. The Sisters and Kingston officials have agreed to negotiate the transfer of isolated land parcels. The DPW is committed to the functional replacement of lands taken from Kingston State Forest and Camp Nekon.

HISTORICAL/ARCHAEOLOGICAL

A portion of the Annasnappet Archaeological District would have been affected. See Sections 3-2 and 4-6.

FARMLANDS

16 acres of cranberry bogs would have been affected.

ALTERNATIVE 6: CORRIDOR 4-M-1

DESCRIPTION

Alternative 4-M-1 was developed in order to minimize the certain negative aspects of Alternative 4-M, for which the latter was rejected; namely, the location of the interchange for the Plympton industrial area, and the number of houses to be acquired. Alternative 4-M-1 coincided with 4-M for its first 1/2 mile east of Route 58 and for the approximately 3 miles of its final section west of Route 3; however, Corridor 4-M-1 swung farther to the north in Carver than any other Alternative and roughly paralleled the Plympton/Carver town line about 500' to its south, before crossing first into Plympton, and then almost 1/2 mile later into Kingston. Its alignment skirted the northern end of Ricketts Pond and the southern end of Trackle Pond, and rejoined Alternative 4-M west of Muddy Pond in a corner of the Kingston State Forest. See MAP 2-B.

This Corridor would have necessitated the dead-ending of Pleasant Street south of the Corridor eastward to Brook Street, because of a grade separation structure at Brook Street. There would have been no interchange here, as in 4-L and 4-M, but there would have been one at Spring Street. There would also have been an interchange at Route 80 about 400' north of the one proposed for Alternative 4-M.

Alternative 4-M-1 was not so much rejected as adjusted. The preferred Alternative 4-M-5 is a variation of 4-M-1, and was developed as a result of frequent consultations with the communities and others involved. During the course of resolving 4-M-1's problems, other variations of it were sketched which were labelled in sequence 4-M-2, 3, 4 and 5. They differed from each other primarily in geometric design, as the balance was sought among the key factors of Camp Nekon State Forest, Sisters property, white bracted boneset, Plymouth Industrial Park, the interchange at Spring Street, cranberry bogs and geometric design policy. Alternative 4-M-1 had the following major problems: (1) it proposed an interchange at Route 80 which the Sisters of Divine Providence believed would adversely affect their property which lies on both sides of Route 80 for a considerable distance and which directly serves their schools, camp and convent; (2) it was located too close to the northern shores of Muddy Pond, resulting in excessive visibility to a girls camp operated by the Sisters, and in possible damage to a State rare and endangered species of plant, the white bracted boneset. Consequently, even if the interchange had been eliminated, the proximity of 4-M-1 to Muddy Pond would have been sufficient reason to reject it. 4-M-1 also affected cranberry bogs, the State Forest, and Camp Nekon, but resolution of these problems is common to 4-M-1 and 4-M-5 and is discussed under the latter.

The 1978 estimated cost for Alternative 4-M-1 was $28,269,000. The 1984 estimated cost, projecting the 1978 cost by using the Annual Price Trend for Federal-Aid Highway Construction-1977 Base, is $48,059,000.

LIKELY IMPACTS

RELOCATION

Five single family, owner-occupied homes in Carver would have had to be acquired for Alternative 4-M-1. Relocation would not have been a problem since sales of newly constructed and turnover single family homes fell well within the estimated value of the homes to be acquired. Neighborhood patterns were not affected.

ECONOMIC

Alternative 4-M-1 would have provided direct service to the Halliday plant in Plympton and to the Plympton industrial area. This Corridor also served the Plymouth Industrial Park. Connection to the industrial area in Kingston was possible, but such a connection is not within the scope of this project.

LAND USE

Corridor 4-M-1 would have affected the properties of the Sisters of Divine Providence, Kingston State Forest, and Camp Nekon, as discussed previously for Alternative 4-M. The basic considerations would have remained the same; namely, that agreements and transfers among the parties involved would have resulted in retention of the open space, and mitigation of losses to public areas.

NATURAL FEATURES

From Route 58 east to Spring Street, this Corridor crossed wetlands associated with the Winnetuxet River and Annasnappet Brook and part of one cranberry bog.

As 4-M-1 passed to the north of Ricketts Pond, it cut diagonally along a steep slope of this large kettlehole. the soils here are highly permeable. They are not susceptible to erosion, but are difficult to revegitate because of their droughty nature.

WETLANDS AND WATER RESOURCES

The majority of wetland and flood-prone-related impacts would have taken place in Carver with minimal impacts in Kingston and Plymouth. A total of about 41 acres would have been impacted, 23 acres of which were wooded swamps.

Although 4-M-1 avoided in large part the cranberry bogs near Cole's Mill, in doing so it resulted in the filling of large portions of other cranberry bogs and a reservoir pond east of Brook Street. Alternative 4-M-1 intruded farther into the headwaters of the Winnetuxet River than did any other proposed Corridor.

Alternative 4-M-1 would have had a significant impact on the well at the Halliday Plant in Plympton and on the potential municipal well site near Trackle Pond. Refer to previous discussion on

closed drainage under Alternative 4-M. It would have required the filling of a portion of a reservoir used in cranberry production just east of Cole's Mill. Another cranberry bog reservoir lay completely within the proposed right-of-way and would have been filled.

Alternative 4-M-1 would have had a greater impact on Ricketts Pond than any of the other Corridors. It would have passed immediately to the south of Trackle Pond, crossing the natural drainage area, down gradient in the direction of the Pond.

NOISE

Twelve houses would have had a noise increase by this Alternative. The increase would have been greater than 15 dBA in two locations, which is considered a severe impact.

AIR QUALITY

No adverse effects.

4(f)

See corresponding discussion for 4-M. Areas to be acquired for 4-M-1 were: 4.9 acres from the State Forest and 4.6 acres from Camp Nekon.

HISTORICAL/ARCHAEOLOGICAL

The Annasnappet Archaeological District would have been affected. Refer to Sections 3-2 and 4-6.

FARMLANDS

Nine acres of cranberry bogs would have been affected, mitigation of which could have occurred as explained in corresponding discussion for 4-M-5.

ALTERNATIVE 7: CORRIDOR 4-N

DESCRIPTION

Alternative 4-N was distinct from the other Corridors in that it utilized the Smith's Lane exit on Route 3 as a terminus and consequently had the northernmost alignment. It began as the other did at Route 58 and coincided with the 4-L/4-M Corridor for the first 1 1/4 miles when it assumed a northeasterly direction, intersecting with Spring Street very close to the Plympton/Carver town line. It traversed a corner of the Plympton Industrial Park for about 5/8 mile before proceeding into Kingston, where it crossed Route 80 at the northwestern corner of the Kingston State Forest about 1/4 mile south of Indian Pond Road. From that point to the Smith's Lane interchange, a distance of about 2 3/4 miles, 4-N went through undeveloped area, skirting the edge of a site which is a potential sanitary land fill for Kingston. It then reversed its curvature in order to reach that interchange while minimizing the

crossing of a 50' ravine and avoiding the Kingston water tower. Alternative 4-N is the only Corridor that served the Kingston Industrial Park directly.

Interchanges were provided at Route 80 and at Spring Street, to serve the Plympton Industrial Park. Traffic destined for the Plymouth Industrial Park would have had to use the Smith's Lane exit and Route 3. See MAP 2-B.

Alternative 4-N was presented to minimize impacts on Camp Nekon and the State Forest, but in doing that it had to be located so far north that its connection with Route 3 occurred at the Smiths Lane interchange, about 1 mile north of Cherry Street. Consequently, 4-N would not have been an effective replacement for existing Route 44 in terms of traffic and service. Alternative 4-N had other negative factors, such as length of road, and acquisition of businesses and 23 acres of cranberry bogs, but the reasons stated first were alone important enough to reject it.

The 1978 estimated cost for Alternative 4-N was $29,179,000. The 1984 estimated cost, projecting the 1978 cost by using the Annual Price Trend for Federal-Aid Highway Construction-1977 Base, is $49,606,000.

LIKELY IMPACTS

RELOCATION

Five single family, owner-occupied homes in Carver and one single family, owner-occupied home in Plympton were to have been acquired for Alternative 4-N. Relocation for the Carver houses presented no problems because of new construction and normal turnover of existing homes. The house in Plympton presented a different problem because it included a separate garage and shop used for the repair of diesel engines, and such a combination of residential and business uses would have been difficult to relocate under prevailing zoning.

Once past the Carver-Plympton town line and the aforementioned house/repair shop, Alternative 4-N involved no other residential displacement. However, when it reaches the Smith's Lane exit on Route 3, the Corridor would have affected two automotive establishments in the northwest quadrant of that interchange, an automobile dealer, and a truck dealer. Some of the structures involved were of the pre-engineered, systemized type, suggesting the possibility of moving them to a new location within the vicinity of the new interchange should Alternative 4-N have been selected.

ECONOMIC

Alternative 7, Corridor 4-N, is the only one which would have served the Kingston Industrial Park directly and the only one which would not serve the Plymouth Industrial Park. This Corridor would also have benefitted the industrial area in Plympton. By cutting through a corner of it, Route 44 would have provided the kind of visibility that Route 128 provides to the buildings bordering it, although its vehicular access would not be direct.

More importantly, there would have been an interchange between 4-N and Spring Street approximately where Spring Street crosses the Carver/Plympton town line, about one quarter mile from the halliday plant. Such an interchange would have relieved traffic on the residential streets which must now be used by the more than 500 employees of the Halliday plant to and from work each day, not to mention truck traffic.

LAND USE

Alternative 4-N, in traversing the Plympton industrial area, would have very likely stimulated its development.

NATURAL FEATURES

4-N would have crossed three cranberry bogs, and wetlands associated with the Winnetuxet River. At its intersection with Route 80, it crossed a cranberry bog and then cut into a steep hillside. Major topographic changes would have occurred at the intersection of Route 80 and 4-N. The potential for soil erosion would have been high.

From Route 80 to Smelt Pond Road, the impacts on topography and soil were not significant. East of Smelt Pond Road, the corridor crossed a deep ravine. As much as 50' of fill would have been required, as well as a bridge to span the ravine.

WETLANDS AND WATER RESOURCES

Construction of Alternative 4-N would have resulted in the loss of approximately 35 acres of wetlands, primarily in Carver, with 23 acres of the total being active cranberry bogs.

Cranberry bogs would also have been affected in Kingston east of Indian Pond, and in the Smelt Brook drainage area.

Alternative 4-N had the potential for impacting the proposed municipal well in Kingston near Tackle Pond, and the Halliday well off Spring Street in Plympton was within 500' of the proposed right-of-way. East of the intersection with Spring Street, runoff from the roadway, while missing the watershed of Ricketts Pond, would eventually have entered several small tributaries of Annasnappet Brook. Closed drainage would have resolved these difficulties.

The potential also existed for contaminants to enter Indian Pond in Kingston via the bog which lies to the east of the Pond. Farther to the east, the corridor passed through the watershed of Wolf Pond. Potential impact to Smelt brook would depend in part on the type of crossing planned.

NOISE

Four houses would have had a noise increase by this Alternative. The increase in noise would have been greater than 15 DBA in three locations, which is considered a severe impact.

AIR QUALITY

No adverse effects.

4(f)

Only 1.7 acres of the State Forest would have had to be acquired, but there would also have been the opportunity to add to the Forest because of other private property isolated by the right-of-way.

HISTORICAL/ARCHAEOLOGICAL

A portion of the Annasnappet Archaeological District would have been affected. See Sections 3-2 and 4-6.

FARMLANDS

23 acres of cranberry bogs would have been affected.

ALTERNATIVE 8: CORRIDOR 4-M-5

This is the preferred Alternative, shown on MAP 2-C. Its environmental consequences are described in detail in Section 4. A description of this Alternative follows.

DESCRIPTION OF THE PREFERRED ALTERNATIVE

Relocation of Route 44 will begin in Carver about 1/4 mile east of the Middleborough/Carver town line on existing Route 44. A new divided highway, two lanes in each direction, will emerge from the existing pavement which is undivided, one lane in each direction. The new road will overpass Route 58 with a diamond interchange, eliminating the present at-grade intersection of Routes 44 and 58. The preferred Alternative 4-M-5, effectively begins at this point.

Continuing easterly, 4-M-5 is north of and generally parallel to High Street for the first two miles. It will cross the Winnetuxet River on a new bridge, and will go through three cranberry bogs and other wetlands associated with the River. It will be north of the historic Cole's Mill site as well as the residential properties along High Street. There will be no grade separation at Pleasant Street, but Pleasant Street will be relocated to meet Brook Street in a new intersection north of 4-M-5. There will be a grade separation at Brook Street with 4-M-5 overpassing it.

After continuing in a straight line for about 1/2 mile, 4-M-5 will begin to turn on a flat curve to the north. In this section the road will cross portions of three cranberry bogs and their reservoirs. Existing Spring Street will be cut by the new highway, and so a cul-de-sac will be constructed at the end of Spring Street south of the right of way. Spring Street will be relocated starting north of the highway about 600 feet from the Halliday plant, to rejoin the existing Spring Street where it intersects with High Street. 4-M-5 will overpass the new Spring Street with a diamond interchange. This alignment will avoid a building

of local historic interest (Israel Dunham) and an industrial well off Spring Street serving the Halliday plant. The interchange will serve directly the several hundred employees of that plant, and will thereby alleviate traffic on local streets in Plympton and Carver. This alignment also minimizes the impact on a residential subdivision in this area.

4-M-5 will then continue in a northerly direction, passing from Carver into Plympton for about 1/2 mile, then into Kingston. In this section, it stays well to the north of Ricketts Pond and Trackle Pond, where there are potential well sites. There will be a grade separation at Route 80, which will overpass the new highway. About 2,000 feet of route 80 will have to be reconstructed in order to provide sufficient vertical clearance. Other rejected Alternatives had proposed an interchange at this point, which would have had significant effects on the schools and camp operated here by the Sisters of Divine Providence, because of increased traffic and noise. At Route 80, 4-M-5 is a cut section in order to accommodate a drain line in the median which will carry storm water from the closed drainage system westerly to the Annasnappet Brook.

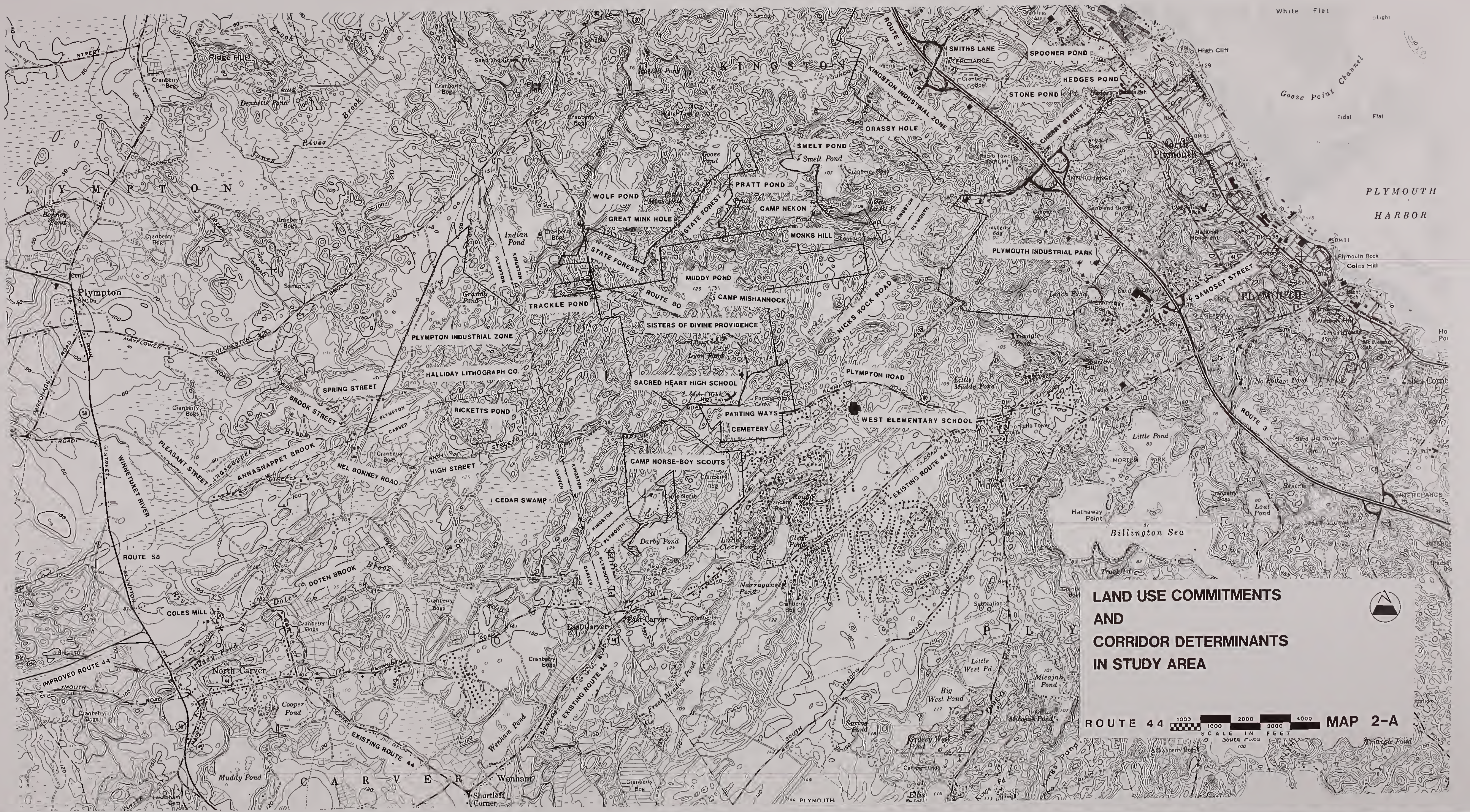
Just east of Route 80, 4-M-5 will begin a turn to an east/southeasterly direction, through the Kingston State Forest, the easternmost portions of the Sisters Land, some private property, and two remote corners of Camp Nekon. It is in this area that 4-M-5 differs most from Alternative 4-M-1, in order to corrects its deficiencies--the avoidance of the northern edge of Muddy Pond, which it will be recalled, is not only the location of the Sisters' girls' camp, but also the habitat of the white bracted boneset, a State listed rare and endangered species of plant. This alignment also avoided the lower slopes of Monks Hill, and minimized the acquisition of land from Camp Nekon. But in making these significant improvements, however, 4-M-5 had to be aligned through Great Mink Hole, a two acre kettlehole wetland.

Approximately at the Kingston/Plymouth town line, the alignment will turn back to a northeasterly direction, in order to provide interchanges with a connector road in the Plymouth Industrial Park, and with Route 3, at the present interchange of 3 and Cherry Street. The new interchange will be configured as a trumpet, with Route 44 overpassing Route 3. Traffic destined for the historic sites and business center of Plymouth will then proceed south on Route 3 to the next interchange at Samoset Street, which will be improved as part of this project, and then easterly on Samoset Street.

The entire length of the new highway will have a closed drainage system in order to avoid adverse effects on the underlying Plymouth Aquifer and on the wetlands through which it must pass. This system is explained in detail in the Engineering Report, which also reviews the other design considerations involved.

When completed, the new road will provide high quality traffic service and will operate at a Level of Service A at the projected traffic volumes, as determined by comparing the projections in FIGURE 1-3-4 to accepted criteria for Levels of Service.

The 1984 estimated cost for Alternative 4-M-5 was $48,500,000.


LAND USE COMMITMENTS
AND
CORRIDOR DETERMINANTS
IN STUDY AREA
ROUTE 44
SCALE IN FEET
1000
2000
3000
4000
MAP 2-A
SMITHS LANE
SPOONER POND
HEDGES POND
STONE POND
KINGSTON INDUSTRIAL ZONE
ORASSY HOLE
CHERRY STREET
SMELT POND
PRATT POND
WOLF POND
CAMP NEKON
GREAT MINK HOLE
STATE FOREST
MONKS HILL
PLYMOUTH INDUSTRIAL PARK
MUDDY POND
ROUTE 80
CAMP MISHANNOCK
TRACKLE POND
NICKS ROCK ROAD
SAMOSET STREET
SISTERS OF DIVINE PROVIDENCE
PLYMPTON INDUSTRIAL ZONE
HALLIDAY LITHOGRAPH CO.
SACRED HEART HIGH SCHOOL
PLYMPTON ROAD
SPRING STREET
RICKETTS POND
PARTING WAYS
CEMETERY
WEST ELEMENTARY SCHOOL
BROOK STREET
PLEASANT STREET
ANNASNAPPET BROOK
NEL BONNEY ROAD
HIGH STREET
CAMP NORSE-BOY SCOUTS
EXISTING ROUTE 44
CEDAR SWAMP
ROUTE 3
ROUTE 58
DOTEN BROOK
COLES MILL
IMPROVED ROUTE 44
WINNETUXET RIVER
L Y M P T O N
K I N G S T O N
C A R V E R
PLYMOUTH HARBOR
Plympton
North Carver
East Carver
North Plymouth
Billington Sea
Little Pond
Wenham Pond
Big West Pond
Little West Pd
Goose Point Channel


COMPOSITE: ALTERNATIVES
3-E AND 3-W, 4-L, 4-M, 4-M-1, 4-N
PROPOSED CORRIDORS
SCALE IN FEET
1000 1000 2000 3000 4000
ROUTE 44
PREPARED OCT. 1985
MAP 2-B
PLYMOUTH HARBOR
Goose Point Channel
White Flat
Tidal Flat
High Cliff
North Plymouth
PLYMOUTH
Plymouth Rock
Coles Hill
INTERCHANGE
EXISTING ROUTE 44
LYMPTON
Plympton
KINGSTON
CARVER
North Carver
Cedar Swamp
Muddy Pond
Smelt Pond
Indian Pond
Darby Pond
Billington Sea
Hathaway Point
Little Pond
MORTON PARK
Little Muddy Pond
Triangle Pond
Big West Pond
Little West Pd
Wenham Pond
Fresh Meadow Pond
Cranberry Bogs
Shurtleff Corner
Wenham
Narraganett
Cole Mill

PREFERRED ALTERNATIVE 4-M-5
PROPOSED CORRIDOR
SCALE IN FEET
1000
2000
4000
1000
3000
PREPARED OCT. 1985
ROUTE 44
MAP 2-C
PLYMPTON
KINGSTON
CARVER
PLYMOUTH
PLYMOUTH HARBOR
Goose Point Channel
North Plymouth
Plymouth
Plympton
North Carver
East Carver
Billington Sea
Cedar Swamp
Smelt Pond
Muddy Pond
Indian Pond
Darby Pond
Little Pond
Hathaway Point
High Cliff
Plymouth Rock
Coles Hill
Shurtleff Corner
Wenham
Wenham Pond
Cooper Pond
Morton Park

SECTION 3

THE AFFECTED ENVIRONMENT

1. SOCIAL AND ECONOMIC

GOVERNMENT

The towns in the study area were incorporated on the following dates: Carver, June 9, 1790; Kingston, June 16, 1726; Plympton, June 4, 1707. Plymouth was founded December 21, 1620. Originally Carver, Kingston and Plympton were part of Plymouth. All four towns have a Town Meeting type of government with a Board of Selectmen in the executive role. They are included in the 12th Massachusetts Congressional District, the 1st Councillor District, the Cape and Plymouth State Senatorial District, the 5th Plymouth State Representative District (Kingston, Plymouth, Plympton) and the 6th Plymouth State Representative District (Carver). All four towns are in Plymouth County.

POPULATION AND ECONOMIC

The population of Massachusetts grew by 0.8% between 1970 and 1975, while the U.S. population increased by 11.4%. Plymouth's population increased 26.9% between the two federal censuses of 1960 and 1970, a very impressive 95.9% between the 1970 and 1980 U.S. Censuses. Carver grew by an extraordinary 159.8% while Kingston was growing by 22.7% and Plympton by 51.4% (See FIGURES 3.1.1 and 3.1.2) The overall picture is one of dramatic residential growth fed largely by those moving away from Boston and Quincy, who are leapfrogging the more built-up and expensive communities between those cities and Plymouth, and who are generally maintaining their employment outside the Plymouth area.

Growth rates much larger than the state average are expected to continue, but not at the rates of the last decade. See FIGURE 3.1.3. The racial composition of the towns in the study area was predominantly white in 1980 with Plymouth having the largest minority population. See FIGURE 3.1.4.

The large migration of population has been reflected in age composition data and school enrollments. Generally speaking, the younger age groups (below 24 years) show growth, while the older age groups (65 and above) have remained the same or declined, reflecting the fact that these towns have proven to be more attractive to families with children rather than to the elderly. See FIGURE 3-1-5.

School enrollment figures for the four towns show that Carver and Plymouth experienced the largest percentage increases. Plympton had a moderate increase in its enrollment, and Kingston's remained relatively stable. These increases, especially in Carver and Plymouth, can be attributed to the migration of families with school-age children.

The average annual wage paid in Plymouth establishments in 1975 was almost 15% lower than the comparable figure for the State; in fact, there has been a consistent difference between the State and Plymouth averages for annual wages. Median family income, as reported in the 1980 census, was also lower in Plymouth than for the State. Plymouth's recent residents are almost entirely

commuters insofar as employment is concerned. Although the statistic for median family income may have improved as a result, wages paid locally continue to be relatively low, partly due to the growing relative importance of jobs in services rather than industry, as explained below. The unemployed were 7.2% of Plymouth's labor force in 1980, compared with 5% for the State, even though employment opportunities and total employment have been increasing in recent years, as demonstrated in FIGURE 3-1-6.

The increase in population has been bolstering Plymouth's position as a center for shopping, banking, insurance, real estate, and other services. FIGURE 3-1-6 shows there was a 128.8% growth in manufacturing jobs between 1970 ad 1980. During the same period jobs in wholesale and retail trade increased by 54.7%, those in financial and other services by almost 217%, and in the transportation-utilities group by 313.9%. Even more dramatic evidence of this situation is given by the fact that between 1970 and 1980, the number of employed in Plymouth increased by 3290, but only 724, or a little more than 18.5%, were in manufacturing jobs.

But FIGURE 3-1-6 also shows that although the number of jobs has increased noticeably in almost all categories, the relative percentage of each category to total employment has remained fairly constant. The total number of jobs in the 5 major categories has remained constant, although there have been adjustments among them as new job opportunities have been created in Plymouth. The most obvious example of this is the sizable increase in the transportation-utilities group, which is accounted for almost entirely by the Pilgrim 1 Nuclear Power Plant. The number of jobs in Plymouth grew by 3920 from 1970 to 1980, but only 18.50% of that increase was in manufacturing jobs, whereas 41.9% was in services. These figures assume even greater significance when reviewed with the average annual wages involved: in 1982 the average for manufacturing jobs in Plymouth was $15,684, compared to $19,698 for the state; for jobs in wholesale and retail trade $16,765 and $7,925 respectively, and $10,784 for all service-type positions. The number of service-related jobs tyherefore depressed the average wage for the Town, even though the average wage in the utilities group was $28,874. See FIGURE 3-1-7.

Another perspective of Plymouth's economic situation can be seen by comparing its data with those for the State as a whole. Whereas manufacturing jobs were only 15% of all jobs in Plymouth in 1980, the comparable figure for the State was 26%; on the other hand, 63.7% of Plymouth's jobs were in service-related fields compared to 32.2% for the State as a whole. See FIGURE 3-1-6.

Data on employment and wages (FIGURE 3-1-8) for Carver, Kingston and Plympton are not directly comparable to those for Plymouth, whose population is more than twice that of the other three towns together, and whose employment is nearly four times their combined total. Plympton has one major industry whose employment and wage data are therefore those of the town as a whole. Kingston has a number of small industrial businesses, employment in which has fluctuated but not significantly, during the past ten years. Kingston's Industrial Park on Route 3 will benefit from an improved Route 44; its service-related employment almost doubled from 1970 to 1976. Plymouth is the central place of the region and is therefore most representative of its problems and potential. Plymouth has two active industrial parks. One is Cordage Park, the former Plymouth Cordage plant; the other is the Plymouth Industrial Park at the Cherry Street/Route 3 interchange. The need persists to improve the local economy through a broader industrial base in order to reduce unemployment, raise local incomes, and increase opportunities for Plymouth residents to work in Town rather than elsewhere.

FIGURE 3-1-1

POPULATION GROWTH

Town	1960	1970	Percent Change 1960-1970	1980	Percent Change 1970-1980
Carver	1,949	2,690	38.0	6,988	159.8
Kingston	4,203	5,999	42.7	7,362	22.7
Plymouth	14,445	18,336	26.9	35,913	95.9
Plympton	821	1,304	58.8	1,974	51.4

Source: 1960, 1970, 1980
U.S. Census

FIGURE 3-1-2

COMPONENTS OF POPULATION CHANGE

	CARVER		KINGSTON	
	1960-1970	1970-1980	1960-1970	1970-1980
Natural Increase	108	687	355	452
Migration	633	3,591	1,341	911
Total Change	+ 741	+4,278	+1,696	+1,363

Source: 1960, 1970, 1980 U.S. Census
1975 State Census, Mass. Dept. of Public Health

FIGURE 3-1-3

POPULATION PROJECTIONS

Town	1980	Popultion 1985	1990	1995	1970-1980 Change	%
Carver	6,988	*	8,173	*	1,185	17.0%
Kingston	7,362	8,137	8,912	9,493	2.131	30.0%
Plymouth	35,913	41,013	46,113	51,319	15,406	42.9%
Plympton	1,974	*	2,300	*	326	16.5%

Source: Old Colony Planning Council (for Kingston and Plymouth); Mass. Dept. of Public Health, 1983

* Not Available

NOTE:

Massachusetts Department of Public Health population projections in 1983 were based on the percent change for four age groups (0-14, 15-44, 45-64, 65+) from 1970 to 1980, and the application of this rate of change for each group to actual 1980 census data to forecast population growth for the year 1990. The forecasts were then reviewed by regional agencies and modified to reflect anticipated trends.

FIGURE 3-1-4

RACIAL COMPOSITION

Race	Carver (%)	Kingston (%)	Plymouth	Plympton (%)	Plymouth County (%)
White	6,624 (95.0)	7,238 (98.3)	34,963 (97.4)	1,931 (97.8)	(96.4)
Black	160 (2.3)	49 (0.7)	523 (1.5)	14 (0.7)	(1.9)
Other	204 (2.9)	75 (1.0)	427 (1.2)	29 (1.5)	(1.6)
Total	6,988	7,362	35,913	1,974	405,437

Source: 1980 U.S. Census

FIGURE 3-1-5

AGE COMPOSITION 1960 - 1980

Group	Carver			Kingston			Plymouth			Plympton		
	1960 %	1970 %	1980 %	1960 %	1970 %	1980 %	1960 %	1970 %	1980 %	1960 %	1970 %	1980 %
0-4	188 9.6	296 11.0	780 11.2	412 9.5	608 10.1	548 7.4	1,347 9.3	1,567 8.0	2,979 8.3	77 9.3	114 9.3	157 8.0
5-14	373 19.1	514 19.1	1,499 21.5	783 18.2	1,242 21.4	1,307 17.8	2,052 17.3	3,192 18.0	6,576 18.3	210 25.5	306 25.0	404 20.5
15-24	301 15.4	418 15.5	815 11.7	494 11.5	806 13.4	1,099 14.9	1,586 10.9	2,624 14.0	4,810 13.4	95 11.5	195 15.9	281 14.2
23-24	214 11.0	360 13.4	1,611 23.1	505 11.7	858 14.2	1,326 18.0	1,496 10.3	2,037 11.0	6,800 18.9	91 11.1		394 20.0
35-44	240 12.4	290 10.8	775 11.1	594 13.8	645 10.8	936 12.7	1,835 12.7	1,815 10.0	4,322 12.0	122 14.8	251 42.6	311 15.8
45-54	232 11.9	314 11.7	403 5.8	565 13.1	647 10.8	666 9.0	1,900 13.2	2,229 12.0	2,774 7.7	83 10.1		169 8.6
55-64	166 8.5	247 9.2	595 8.5	397 9.2	582 9.7	615 8.4	1,659 11.5	2,201 12.0	3,124 8.7	72 8.7		143 7.2
65+	235 12.1	251 9.3	510 7.3	552 12.8	574 9.6	865 11.7	2,100 14.6	2,835 15.0	4,528 12.6	71 8.6	88 9.6	115 5.8
Total Pop.	1,949	2,690	6,988	4,302	5,999	7,362	14,445		35,913	821	1,304	1,974

Source: 1960, 1970, 1980 U.S. Census

FIGURE 3-1-6

EMPLOYMENT IN PLYMOUTH 1970 - 1980

Year	Total Employment	Avg. Annual Wage	Wholesale & Retail Trade Emp. (%)	F.I.R.E.* Emp. %	Service Emp. %	Combined & Service Related	MFG 1970 Emp. %	Total % Service MFG	Trans, Comm & Util. Emp. %	Total % Service MFG & Util.
1980	8,564**	$12,465	2625 (30.7)	352 (4.1)	2472 (28.9)	63.7	1286 (15.0)	78.7	1159 (13.5)	92.2
1982	9,295**	$14,026	2902 (31.2)	461 (5.0)	2917 (31.4)	67.6	1316 (14.2)	81.8	962 (10.3)	92.1

* Finance, Insurance, Real Estate

** Since employment in Government was reported only for years 1980 and 1982 it has been deducted from total employment for these years so these figures would be comparable to data available for other years.

Source: Mass Division of Employment Security

FIGURE 3-1-7

COMPARATIVE ANNUAL WAGES 1982

	Mass.	Plymouth	Plympton	Kingston	Carver
Manufacturing	19,698	15,684		17,369 (151)	9,801 (12)
Transp./Utilities	22,040	28,874			18,795 (7)
Trade (Wholesale)	11,543[1]	16,765		13,782 (36)	14,041 (10)
(Retail)		7,925	10,380 (21)	7,511 (788)	11,608 (49)
F.I.R.E.[2]	18,128	11,782	10,855	(56) 11,230	(8)
Service	14,575	10,784	12,819 (8)	7,241 (89)	
All (Average)	16,309	13,712	13,393[3] (730)	10,236 (1336)	10,899 (251)

1. Wholesale and retail combined.
2. Finance, Insurance, Real Estate
3. All "selected" sectors

Source: Mass. Divisional Employment Security
Note: Number given in parentheses indicates number of establishments in category

FIGURE 3-1-8

COMPARATIVE EMPLOYMENT 1976 - 1982

	Carver		Kingston		Plymouth		Plympton	
	1976	1982	1976	1982	1976	1982	1976	1982
Total Annual Payroll ($000's)	782.2	4,513.0	6,022.6	21,078.5	49,562.8	154,969.0	5,572.5	9,777.5
Avg. Annual Wage	$5,047	10,901	7,491	11,775	8,465	14,026	9,575	13,393
No. Establishments	30	68	101	163	538	681	24	24
Total Employment	155	414	804	1,790	5,857	11,048	582	730
Government		163		454		1,753		100
Agriculture	16	C	33	C	38	C	0	0
Mining	0	0	0	0	0	0	0	0
Construction	17	C	58	52	2,160	331	30	8
Manufacturing	0	12	176	151	725	1,316	523	C
Trans. Comm. & Util.	15	7	97	C	725	962	3	C
Wholesale & Retail Trade	28	59	375	824	216	2,902	7	21
Finance, Ins. Real Estate	0	8	12	56	293	461	2	C
Services	79	C	53	89	1,700	2,917	17	8

1. Data for Government was not available for 1976

2. Note: "C" indicates confidential data

Source: Massachusetts Division of Employment Security

2. ARCHAEOLOGY AND HISTORY

It is known that Southeastern Massachusetts was intensively utilized by aboriginal peoples. Numerous occupation sites reflect prehistoric subsistence patterns, principally based on hunting and gathering activities. Exploitation of waterways and marsh areas for fish, waterfowl, and dependent fauna led to intensive settlement near such areas. Terrain possessing sparse water supply, on the other hand, was utilized principally for hunting. Settlement in this terrain consisted mainly of small temporary camps. Late prehistoric agriculturalists occupied semi-permanent villages near abundant water sources and used neighboring land for their fields. The distribution of known sites in the region reflects these subsistence patterns and indicates high potential for the occurrence of prehistoric remains in the following physical contexts: near rivers, brooks, and ponds; and on the fringes of marshlands.

Even without field investigation it was considered the greatest potential for sites would lie in the western part of the project area, reflecting the terrain. The northeastern corner of Carver is comprised of a relatively low-lying area of marsh and cranberry bogs. The Winnetuxet River runs through this area, which with the subsistence resources it supports probably provided better locations for prehistoric settlement than the areas to the east, which are mostly comprised of hilly woodland.

Archaeological investigation of the 4-M-5 corridor confirmed these expectations when a prehistoric site was found. The Massachusetts Historical Commission and the State Historic Preservation Office have determined that the site is significant, and is eligible for potential nomination to the National Register of Historic Places. Mitigation procedures involving full scale recovery is warranted.

The historic character of the four towns involved is closely linked to the earliest period of European settlement in New England. Following the arrival of the Mayflower in 1620, the initial Plymouth Colony acquired all adjacent territory from the Indians including the present Carver, Plympton, and Kingston. Initially, the economy was almost entirely agriculturally based but fishing and ship building industries grew along the coast, east of the present Route 3.

The towns of Carver and Plympton, united until 1790, remained mainly agricultural in nature throughout their histories. A modest iron smelting industry existed in Carver during the late 18th and early 19th centuries, while a rolling mill, shovel works, cotton mill, woolen factory, nail and tack factories, and shoe factories functioned in Carver and Plympton during the 18th and 19th centuries. These enterprises, however, represent localized industrial development rather than a general shift from an agricultural economic base. During the 20th century, the production of cranberries has become the dominant industry in the whole region with tourism replacing the maritime-based activities along the coast.

This historic development led to a corresponding settlement pattern and strongly influenced the location of preserved historical properties. The greatest concentration of such properties lies east of Route 3 near the coast, which was the largest settlement locus of the region throughout the European period. A large part of the area has been incorporated into a Historical District, reflecting its history. Elsewhere, the settlement patten is

generally dispersed, reflecting its agricultural base, and historical properties are correspondingly fewer and scattered. The proposed relocation of Route 44 will not affect any historic site.

3. NATURAL FEATURES

PROJECT STUDY AREA

The original project area was shaped like a nose cone on its side: a narrow blunted vertex at the intersection of Route 44 and Route 58 in Plympton, and its broad base parallel to and east of Route 3. The soutern side roughly paralleled existing Route 44, and the northern side was a northeasterly line from Route 58 to Route 3 just north of the Smith's Lane interchange.

Most of the general descriptive material which follows pertains to this large project area, but not necessarily to the selected corridor. In fact, comparatively little applies to it; given the complexity of the project area and the large number of potential impacts, the selected corridor contains the fewest possible.

GEOLOGY, TOPOGRAPHY AND SOILS

Plymouth County was close to the southernmost end of the last glacial advance and was subjected to its many movements. The landscape is therefore characterized by morainal hills, varying depths of glacial till, sandy and gravelly outwash plains and terraces, and windblown deposits of silt and sand. There are many lakes, ponds, kettleholes, marshes and bogs. The conditions necessary for cranberry bogs abound in the region.

The elevation of most of the project area is between 100 and 200 feet above sea level. Monks Hill, at slightly over 300 feet, is its highest point. The dominant soils are mostly deep loamy sands, well drained and very dry. Secondary soil types include peat and marshy soils.

The project area soils are for the most part currently suitable for highway construction in that they are well drained and easily compacted. The absence of rock ledge will facilitate cuts and excavation. However, the high degree of permeability and the comparative lack of organic content is likely to make vegetation difficult to reestablish on new slopes created by cut and fill operations.

VEGETATION AND WILDLIFE

Most of the project area is forested. The forest cover consists of two principal types, wetlands vegetation and upland vegetation. Wetlands vegetation is mostly limited to the area between Route 58 and Route 80. Wetland areas principally contain red maple, black gum, atlantic white cedar and some American Holly.

The remainder of the forest cover is upland vegetation which is found in two categories. Pitch pine and scrub oak grow in the dry sandy soils, in areas

that are known to have burned over between thirty and forty years ago. The stands of pitch pine and scrub oak are the smallest trees in the project area. The second category of upland vegetation is found in upland areas with richer soils that contain white, black and scarlet oaks, black birch and white pine. Most of these are between 40 and 60 feet in height. There are small stands of large trees scattered throughout the project area.

Forest cover will inevitably need to be taken for part of the highway corridor. But there are no forest types in the project area that should be considered an impediment to highway construction. Larger hardwoods and softwoods to be taken down during construction may be cut for saw timber with branches and tops used for pulp and wood chip. Smaller hardwoods, including scrub oak may be cut for cord wood. Clearing for the highway right of way will expose trees at the edges of the corridor to greater light and air, and they will take on an improved appearance a few years after construction is completed.

The world's largest population of a rare plant, the white-bracted boneset (Eupatroium leucolepsis var. novae-angliae), is located along eastern shores of Muddy Pond in Kingston. The corridor for relocated Route 44 was shifted in order to avoid this plant's habitat.

Wildlife habitats are related to vegetative types. There are two principal habitats. Upland mammals found in the project area include whitetailed deer, snowshoe hares, cottontail rabbits, gray squirrels, flying red squirrels, and raccoon. The area around Muddy Pond is a known deer habitat. Birds include partridge, bobwhite, quail, ring necked pheasant, woodcock owls, and various songbirds. Upland wildlife is particularly abundant in abandoned fields and at the edge between forested and open land, where greater exposure to sunlight produces a wider variety of plants for food and cover.

Waterbodies and wetlands provide the most abundant wildlife habitat in the region. Wetlands mammals include muskrat, otter, opossum, raccoon, weasels and some beavers. Birds include black ducks, hooded mergansers, green and blue winged teal, Canada geese, green herons, black crown night herons, great blue herons, American egrets, snowy egrets, American bitterns and a variety of songbirds. Fish in the ponds and streams of the project area include brook trout, brown trout, and rainbow trout among the cold water species. Warm water species include large mouth bass, small mouth bass, chain and red fin pickerel, and blue gills. Other fish include horn pout, perch, white and chub suckers.

GROUNDWATER

Groundwater is the principal source of drinking water supplies for the communities in the vicinity of the preferred Alternative 4-M-5. The Towns of Plymouth and Kingston meet these requirements by a combination of large volume municipal wells, and private wells for individual users, while Carver and Plympton residents are currently served entirely by private wells. For the most part, groundwater throughout the region is found under unconfined conditions in association with varied surficial deposits and soils (see MAPS 4-F and 4-G).

The depth to the water table varies throughout the region, with a seasonal range which averages approximately three ft between high and low levels. The water table is generally deepest (50-90 ft) below large hills, while it intersects the ground surface at ponds, streams, and springs.

Recharge of the groundwater system in the vicinity of preferred Alternative 4-M-5 is primarily through the soils which are excessively drained, highly porous, and permeable. Consequently, it transmits a large percentage of the 44-45 in. of annual rainfall which reaches the ground surface. In general, precipitation infiltrates through the soil downward into the zone of saturation, and then moves laterally downgradient. Discharge occurs in wetlands, streams, springs, wells, or the ocean, with some lateral movement beneath wetlands and ponds, as well as through them. Movement generally occurs perpendicular to the groundwater contour lines in a downgradient direction driven by gravity.

Plymouth is the largest user of groundwater in the project area, drawing from a total of seven municipal wells, each of which has a capacity in excess of 1 million gallons per day (gpd). There are several private water supply companies in Plymouth, as well. The North Plymouth municipal well is located closest to the preferred Alternative 4-M-5. At its closest point, Alternative 4-M-5 is approximately 1,700 ft from the North Plymouth well. This well has a yield of 1.44 million gallons per day (gpd). An additional well is being considered at Darby Pond about 2.5 miles to the southwest of this location and over 1 mile to the south of the proposed roadway (see MAP 4-G).

Kingston maintains a public supply well about 4,000 ft to the north of the proposed alignment, at Grassy Hole. This well provides 1.2 million gpd of water to Kingston, which is considering the installation of an additional well near this site.

Water quality from the North Plymouth and Grassy Hole wells is within the criteria for potable water supplies. The results of analyses conducted by the Massachusetts Department of Environmental Quality Engineering in 1984 are presented in FIGURE 3-3-1. Parameters of concern, as regards potential highway runoff, include sodium, iron, and chloride, each of which is currently within allowable national secondary and Massachusetts drinking water levels of 20 mg/l (reporting and notice standard only), 0.3 mg/l and 250 mg/l, respectively.

While there are no other municipal water supply wells currently operating in the corridor of the preferred Alternative 4-M-5, several additional sites have been identified in both Kingston and Plympton. Kingston has located sites at both Trackle Pond and Muddy Pond, and has purchased property at the former location. Should these wells be constructed, they would be within 1,000 ft of the proposed roadway.

Plympton has selected a location to the south of Brook Street as a potential site for a municipal well field. Currently, Plympton is serviced entirely by private wells, and there are no plans at present to purchase or develop a municipal system.

In addition to municipal wells, there are several large private wells in the vicinity of preferred Alternative 4-M-5. Mayflower Sand and Gravel Company has an 82 ft deep well which has a capacity of 1,000 gpm adjacent to the proposed alignment, to the north of the North Plymouth municipal well. In Kingston, Sacred Heart School has two wells, each with a capacity of 100 gpm, located approximately 3,000 ft south of the alignment. The Halliday Lithograph Corporation is supplied by a 500 gpm well located off Spring Street in Plympton. Plympton Sand and Gravel also operates a 30 ft deep well located

FIGURE 3-3-1

GROUNDWATER QUALITY

NORTH PLYMOUTH (PLYMOUTH) AND GRASSY HOLE (KINGSTON) MUNICIPAL WELLS*

Parameter	Concentration North Plymouth Well	Concentration Grassy Hole Well	National/MA Drinking Water Standard
Date of Collection	4/27/84	3/21/84	
Turbidity	0.1	0.3	1 (turbidity unit)
Sediment	0.0	0.0	--
Color	0.0	5.0	15 (color units)
Odor	0.0	0.0	3 (threshold odor number)
pH (units)	6.0	6.7	6.5-8.5
Alkalinity - Total ($CaCO_3$)	8.0	13.0	--
Hardness ($CaCO_3$)	9.0	12.0	--
Calcium	1.7	2.9	--
Magnesium	1.2	1.1	--
Sodium	5.8	5.5	20.0
Potassium	0.6	0.5	--
Iron	0.06	0.05	0.3
Manganese	0.00	0.02	0.05
Sulfate	4.0	3.0	250.0
Chloride	9.0	8.0	250.0
Specific Conductance (mhos/cm)	66.0	57.0	--
Nitrogen (Ammonia)	0.00	0.00	--
Nitrogen (Nitrate)	0.1	0.3	10.0
Nitrogen (Nitrite)	0.001	0.000	--
Copper	0.14	0.02	1.0

* All concentrations and standards are milligrams/liter, unless noted otherwise.

Source: MA Department of Environmental Quality Engineering, 1984

approximately 3,500 ft northwest of the proposed alignment. There are a limited number of low yield private wells in the vicinity of the proposed alignment, servicing primarily residences and small business.

WATER QUALITY

The three surface water bodies that will be affected by the preferred Alternative 4-M-5 and for which water quality data exist are the Winnetuxet River, which is traversed by the alignment near Route 58; Annasnappet Brook, which passes to the north of the alignment along the Plympton-Carver town line; and a brook which flows east from Route 3 toward Stone Pond, Hedges Pond, Spooner Pond, and Plymouth Harbor (see MAP 2-A). Water quality information on these waters is presented in FIGURE 3-3-2. Water quality in the Winnetuxet River is generally good. The water is well aerated, and levels of chloride and metals (with the exception of iron) are low. The data show a trend of increasing levels of inorganic nutrients. Total alkalinity (a measure of the stream's buffering capacity) appears to have risen sharply. The data for Annasnappet Brook are very similar, with elevated iron levels and slight (ammonia nitrogen) to serious (total phosphorus) nutrient enrichment. The data for the brook near Route 3 are quite variable with respect to levels of chloride and several metals. The station at Cherry Street showed elevated levels of sodium, chloride, iron, and manganese in comparison with the station near Stone and Hedges Ponds. This presumably reflects the influence of the Route 3/Cherry Street interchange, which is located near the Cherry Street station but one-half mile or more upstream from the Stone/Hedges Pond station. Alkalinity levels (and hence buffering capacity) are low.

FISHERIES

The only pond that will be affected by the proposed alignment and for which any fisheries information was available is Great Mink Hole in Kingston. The information was limited to a notation that Great Mink Hole is not stocked.

In general, however, each surface water body in the study area is at least potentially capable of supporting a warmwater fishery. Typical species would include largemouth bass, pickerel, yellow perch, bullhead, and sunfish.

WETLANDS

Seventeen (17) wetland areas consisting of six (6) wetland community types are located within the preferred Alternative 4-M-5 alignment (see MAP 4-J). Based on the U.S. Fish and Wildlife Service (U.S. FWS) wetland classification system, these types include wetlands belonging to the Palustrine and Riverine Systems. Specifically, wetland types consist of Palustrine forested, scrub/shrub, emergent and open water communities, as well as Riverine open water. A more detailed discussion of the U.S. FWS wetland classification system is provided in the Technical Appendix.

With respect to the U.S. FWS classification system, active cranberry bogs would be categorized as Palustrine scrub/shrub communities. However, in order to distinguish these areas from other naturally occurring wetlands, active cranberry bogs have been classified and discussed as such in this FEIS.

FIGURE 3-3-2

EXISTING AND HISTORICAL WATER QUALITY
(mg/l unless noted)

	Winnetuxet River At or near Headwaters			Annasappet Brook Near Source	Unnamed Brook at Rt. 3 Near Stone Hedges Pond	Unnamed Brook at Rt. 3 at Cherry St.	
Date:	11/23/77	12/9/80	8/24/83	8/24/83	12/9/80	8/24/83	9/25/83
Color CPC units (apparent true)	50/	39.0/-	90/76	101/75	20.0/-	102/44	--
Total Alkalinity	6.6	3.88	126.0	209.0	10.81	7.5	--
Chloride	10.1	11.6	7.0	7.5	21.0	120.0	110.0
Turbidity (NTU, JTU*)	2.6	1.3*	28.0	34.0	1.0*	37.0	--
Cadmium	0.006	0.006	0.005	0.005	0.006	0.005	--
Chromium	0.03	0.01	0.01	0.01	0.01	0.01	--
Copper	0.02	0.01	0.01	0.01	0.01	0.01	--
Iron	1.28	0.66	1.06	1.22	0.02	0.87	--
Lead	0.05	0.01	0.02	0.02	0.01	0.02	--
Manganese	0.08	0.10	0.01	0.03	0.02	0.64	--
Mercury (micrograms/1)	1.0	--	0.27	0.53	--	0.99	--
Sodium	6.5	3.8	5.1	5.1	6.3	130.0	120.0
Zinc	0.02	0.01	0.01	0.005	0.01	0.02	--
Ammonia-N	0.06	0.03	0.17	0.17	0.02	0.18	--
Nitrate-N	0.01	0.06	0.003	0.035	0.14	0.04	--
Total Phosporous	0.04	0.02	0.085	0.134	0.01	0.03	--
Oil and Grease	2.0	2.6	2.6	3.8	2.6	2.0	--
Phenols	0.001	0.001	0.004	0.001	0.001	0.004	--
PH (units)	6.0	5.99	6.0	5.8	6.35	5.5	--
Carbon Dioxide	7.0	6.25	18.0	18.0	3.75	18.0	--
Dissolved Oxygen	9.0	12.0	8.0	6.0	12.0	8.5	--
Biochemical Oxygen Demand	0.8	1.07	1.45	0.64	1.06	0.74	--
Chemical Oxygen Demand	11.2	8.0	10.6	12.37	4.20	11.48	--
Total Solids	--	65.9	14.25	9.75	69.8	55.0	--
Suspended Solids	1.1	0.9	6.75	4.85	1.8	8.8	--
Dissolved Solids	54.0	65.0	7.5	4.9	68.0	46.2	--
Conductivity (umhos/cm)	70.0	69.0	149.0	97.0	82.0	719.0	690.0
Total Coliform Bacteria (#/100 ml)	300.0	90.0	--	--	140.0	--	--
Fecal Coliform Bacteria (#/100 ml)	--	--	100.0	100.0	--	110.0	--

FIGURE 3-3-3 provides the existing preconstruction right-of-way acreage for each of the seventeen wetland areas to be traversed by the preferred Alternative 4-M-5. These acreages are grouped further by wetland community type and municipality. FIGURE 4-1-7 indicates the wetland acreage within the right-of-way to be affected by the proposed project.

A discussion of each of the seventeen wetland areas contained within the proposed right-of-way is presented below. Refer to MAPS 4-J-1 through 4-J-14.

Wetland No. 1, located within the eastern cloverleaf of the Route 3/Cherry Street interchange consists of Palustrine emergent and open water communities. For areas, refer to FIGURE 3-3-3. Although technically isolated, the emergent community is considered a bordering vegetated wetland under MA Wetlands Protection Act regulations (310 CMR 10.00 et seq) due to the open water portion of the overall area being greater than 10,000 ft^2. Plant species associated with the wetland's emergent community are primarily herbaceous, including jewelweed, nightshade, yellow loosestrife, sensitive fern, soft rush, and tussock sedge, among others. Such woody plant species as elderberry, highbush blueberry, and bayberry are present in limited abundance. The open water community is, for the most part, unvegetated.

Wetland No. 2 consists of a streamside Palustrine forested and emergent wetland, and is located within the same cloverleaf and interchange as Wetland No. 1. For areas, refer to FIGURE 3-3-3. The forested portion of the wetland consists primarily of red maple in the canopy or overstory. Understory species characteristically include alder, poison ivy, arrowwood, willow, jewelweed, sensitive fern, and skunk cabbage. The emergent wetland area contains, for example, cattail, waterwillow, joe-pye-weed, jewelweed, soft rush, sensitive fern, cinnamon fern, wool grass, and steeplebush.

Wetland No. 3 consists of a streamside Palustrine forested wetland located west of Route 3 within the cloverleaf of the Route 3/Cherry Street interchange. For areas, refer to FIGURE 3-3-3. Red maple constitutes the dominant overstory species. In contrast, the understory exhibits a relatively diverse mixture of plant species. These include alder, arrowwood, highbush blueberry, swamp azalea, burreed, waterwillow, leatherleaf, arrow-leaved tearthumb, and reed grass, among others.

Due to the relatively small size and location of each of the above-referenced wetlands within roadway interchange sites, their suitability for wildlife is somewhat limited. During field investigations conducted in July, 1984, a total of six species of wildlife was observed at these wetlands. These include red-winged blackbird, catbird, swamp sparrow, common grackle, swallows, and bullfrogs. Although additional species are anticipated to periodically use these wetlands, the overall diversity and abundance of wildlife at these sites is expected to be low.

A list of plant species recorded for each of the seventeen wetland areas associated with the preferred Alternative 4-M-5 is provided in the Technical Appendix, which also provides a list of wildlife species observed and expected to occur in association with each wetland community type along the proposed alignment.

FIGURE 3-3-3

WETLAND ACREAGES
PREFERRED ALTERNATIVE 4-M-5 RIGHT-OF-WAY*

Wetland No.	Wetland Community Type**					Total Acreages Within Each Wetland	
	P-F	P-S/S	P-EM	P-OW	CB	OVERALL	WITHIN RIGHT OF WAY
Plymouth							
1			0.31	0.25		0.59	0.56
2	0.18		0.28			0.54	0.46
3	1.64					1.70	1.64
4	0.52		2.94	0.17		24.07	3.63
5			0.10	1.65		1.78	1.75
Subtotal	2.34		3.63	2.07		28.68	8.04
Kingston							
6		0.05		0.07		0.35	0.12
7			0.06			0.22	0.06
8		0.01				7.12	0.01
9		0.39		2.02		2.49	2.41
10	0.10			0.07		0.32	0.17
11		0.02				0.02	0.02
12		0.66				1.56	0.66
Subtotal	0.10	1.13	0.06	2.16		12.08	3.45
Plympton							
12		5.88				10.66	5.88
Subtotal		5.88				10.66	5.88
Carver							
13	1.88	4.18	2.72	5.20	8.72	51.03	22.70
14	0.75	0.72				5.72	1.47
15	1.40		1.56		4.95	96.81	7.91
16	3.51					76.87	3.51
17			2.43			2.64	2.43
Subtotal	7.54	4.90	6.71	5.20	13.67	233.07	38.02
Total	9.98	11.91	10.40	9.43	13.67	284.49	55.39

* Acreage calculations are based on the <u>entire</u> right-of-way and an average width of 400 ft.

** Palustrine Forested (P-F)
Palustrine Scrub/Shrub (P-S/S)
Palustrine Emergent (P-EM)
Palustrine Open Water (P-OW)
Cranberry Bog (CB)

The area of Wetland No. 4 affected by the preferred Alternative 4-M-5 constitutes only a portion of the wetland's overall acreage, as shown in FIGURE 3-3-3. Within the right-of-way, Palustrine forested, emergent, and open water communities occur. Scrub/shrub vegetation is also associated with this wetland to the south of the alignment.

The majority of Wetland No. 4 consists of an abandoned cranberry bog. Overall, the diversity of vegetation is relatively high. Plant species characteristic of forested and scrub/shrub wetlands include red maple, sweet pepperbush, sweetbells, highbush blueberry, maleberry and tussock sedge. Emergent communities typically consist of waterwillow, soft rush, wool grass, steeplebush, and sphagnum, as well as a variety of woody plant species. Open water areas are, for the most part, unvegetated.

Wildlife species observed included red-winged blackbirds, northern oriole, eastern kingbird, common flicker, bullfrogs and green frogs. Due to the diversity of wetland types and plant species associated with this wetland, the diversity and abundance of wildlife is also anticipated to be high. Numerous additional species are expected to occur in this area on a permanent or migratory basis.

Wetland No. 5 is located within the Mayflower Sand and Gravel Company quarrying operation, is associated totally with the southernmost cloverleaf of the proposed Plymouth Industrial Park interchange. Wetlands in this area consist of three unvegetated open water areas and a small emergent wetland dominated by reed grass. For areas, refer to FIGURE 3-3-3.

These wetlands are undoubtedly the result of sand and gravel removal. Eventually, excavation activities extended below existing groundwater elevations, resulting in the discharge of groundwater into depressions onsite. The suitability of Wetland No. 5 for wildlife is quite limited. This is due to the lack of vegetation in and near the wetland and the continued disruption generated by quarrying activities.

Wetlands Nos. 6, 7, 10 AND 11 are small kettlehole-associated wetlands, all located in Kingston. Their areas are shown in FIGURE 3-3-3. Wetland No. 10 has the most wetland acreage within the preferred Alternative 4-M-5, while Wetland No. 11 has the least wetland acreage within the same area.

The plant species composition associated with the same wetland community types at each location is similar. Open water areas at Wetlands Nos. 6 and 10 are primarily unvegetated, while Palustrine scrub/shrub communities associated with Wetlands No. 6 and 11 are both dominated by red maple and highbush blueberry, with sweet pepperbush and swamp azalea occurring in lesser abundance. Waterwillow constitutes the dominant plant species at the Palustrine emergent Wetland No. 7. In addition to open water, Wetland No. 10 also contains a Palustrine forested community composed, for the most part, of red maple, highbush blueberry, sweet pepperbush, and sheep laurel.

Wildlife observations were limited to green frogs and bullfrogs at Wetlands Nos. 6 and 11, respectively. Although small in size, the location of these wetlands in relatively isolated and undisturbed surroundings enhances their status as habitat, particularly for small mammals and amphibians. Many species of the latter wildlife groups, for example, depend upon woodland ponds for breeding. Based on field investigations, each of the above-referenced wetlands

are anticipated to serve this function. The value of these wetlands for larger species of mammals and birds, however, is expected to be diminished by the wetlands' overall size limitations.

Wetlands Nos. 8 and 9 consist of Pratt Pond and Great Mink Hole, respectively. Areas involved are shown in FIGURE 3-3-3. Only a very small portion of a Palustrine scrub/shrub wetland associated with Pratt Pond occurs within the preferred Alternative 4-M-5. In contrast, most of the open water and surrounding scrub/shrub vegetation at Great Mink Hole is located along the proposed alignment.

Right-of-way wetland vegetation associated with Pratt Pond and Great Mink Hole includes red maple, sweet pepperbush, swamp azalea, and highbush blueberry. At Great Mink Hole, open water is primarily unvegetated, although water lilies are present in scattered locations.

Great Mink Hole constitutes an isolated kettlehole, with a surface water area within the right-of-way of approximately 2.0 acres. Due to the size of this open water area, the Palustrine scrub/shrub vegetation which surrounds the open water is considered a bordering vegetated wetland pursuant to the MA Wetlands Protection Act and associated regulations.

Similar to Wetlands No. 6, 7, 10 and 11, Great Mink Hole represents a suitable breeding site for area amphibians dependent on the presence of open water habitats during the spring breeding season. Although nesting sites are limited, Great Mink Hole is also anticipated to serve as both a feeding and resting site for marsh birds and waterfowl, particularly during the migratory season.

The Palustrine scrub/shrub community of Wetland No. 12 lies within two towns, as shown in FIGURE 3-3-3. Approximately 10.1 percent is located in Kingston; the remaining 89.9 percent is in Plympton. The latter is the only wetland area directly affected by the proposed project in Plympton.

The diversity and density of vegetation in this area is moderate, with a variety of woody plant species being present. The most abundant of these include highbush blueberry, red maple, swamp azalea, sheep laurel, and arrowwood. Waterwillow, steeplebush, and sphagnum are also present, however.

This wetland community provides suitable habitat for a variety of wildlife species, particularly passerine species and songbirds. Common yellowthroat, brown thrasher, and cedar waxwing were observed during field investigations. However, both the diversity and density of vegetation provide numerous feeding, resting, and nesting locations for avian fauna.

Wetland No. 13 constitutes one of the more diverse wetland associations located within the preferred Alternative 4-M-5. Community types include Palustrine forested, scrub/shrub, emergent,and open water areas, as well as active cranberry bogs. For areas, refer to FIGURE 3-3-3.

Palustrine forested wetlands typically contain red maple in the overstory, with sweet pepperbush, arrowwood, highbush blueberry, skunk cabbage, and cinnamon fern being most abundant in the understory. Scrub/shrub wetlands consist of the majority of plant species characteristic of forested wetlands. However, the diversity of these areas is relatively greater, with swamp azalea,

sweetbells, alder, pussy willow, elderberry, steeplebush, meadowsweet, and sheep laurel also being present. Palustrine emergent wetlands consist, for the most part, of cattail, reed grass, waterwillow, wool grass, and soft rush, while open water communities contain water lilies, spatterdock and duckweed.

In terms of wildlife, the active cranberry bogs are, perhaps, the least suitable habitats relative to the other wetland types. Although drainage channels associated with the bogs may contain such species as northern water snakes, eastern painted and spotted turtles, green frogs, and bullfrogs, the value of active cranberry bogs to other species of wildlife characteristic of the region is limited.

The naturally occurring and vegetated wetlands comprising the remaining communities at this location are, in contrast, much more highly productive from a wildlife perspective. This is due not only to the diversity of vegetation and wetland types, but also to the high degree of vegetative juxtaposition, interspersion and edge exhibited in this area. Each of these characteristics serves to augment the overall diversity and abundance of wildlife. Wildlife species observed during field investigations include wood duck, common grackle, eastern kingbird, common flicker, cedar waxwing, American goldfinch, eastern painted turtles, and bullfrogs.

Wetland No. 14 consists of Palustrine forested and scrub/shrub communities located immediately north and east of High and Brook Streets, respectively. As indicated in FIGURE 3-3-3, essentially equal amounts of these wetlands occur within the preferred Alternative 4-M-5.

Forested wetlands consist of a mixture of dead and/or dying trees interspersed with scrub/shrub and emergent vegetation, as well as open water areas. Scrub/shrub vegetation is also associated with a transmission line corridor which traverses this wetland. Overall, scrub/shrub areas are dominated by red maple, sweet pepperbush, highbush blueberry, and steeplebush. Emergent portions of the wetland consist of waterwillow, wool grass, sedges and smartweed, among others.

Due to the diversity, juxtaposition, and interspersion of wetland types, the diversity and abundance of wildlife at this location is anticipated to be relatively high. Although somewhat limited in overall size, the above-referenced vegetative characteristics increase the extent of edge habitat, thus increasing the availability of ecological niches for a variety of wildlife species. Species of wildlife observed at Wetland No. 14 include red-winged blackbirds, common grackles, starlings, green heron, green frogs, and bullfrogs.

Wetland No. 15 is located north and west of High and Pleasant Streets, respectively. It contains Palustrine forested and emergent wetlands, and active cranberry bogs. Areas are shown in FIGURE 3-3-3.

Forested wetlands typically contain red maple in the overstory. Understory species commonly consist of sweet pepperbush, highbush blueberry, ironwood, alder, sweetbells, swamp azalea, cinnamon fern, and skunk cabbage. The wetland's emergent community is predominantly characterized by waterwillow, with areas of open water also present.

Although not as vegetatively diverse as Wetland No. 13, Wetland No. 15 does exhibit a relatively moderate diversity of wetland vegetation and community types. Consequently, wildlife diversity and abundance is also expected to be moderate. No species of wildlife were observed during field investigations. Regardless, this wetland area is anticipated to support a variety of mammals, birds, reptiles and amphibians, either as permanent residents or migrants.

The Winnetuxet River, a Riverine open water community, and adjacent Palustrine forested wetland comprise Wetland No. 16. For areas, refer to FIGURE 3-3-3. The forested wetlands are similar to each of the previously described wooded wetlands. Canopy or overstory species consist almost exclusively of red maple, while understory species include elm, arrowwood, pussy willow, highbush blueberry, sweet pepperbush, alder, elderberry, and skunk cabbage. The Winnetuxet River is primarily unvegetated, with sphagnum and duckweed occurring in scattered locations.

Although exhibiting only forested wetlands, the presence of the Winnetuxet River serves to augment the overall value of this wetland area in terms of wildlife. A variety of mammals, including raccoons, striped skunks, opossums, and muskrat are anticipated to be attracted to this area where both sources of food and adequate cover are located. Great horned and barred owls, as well as black-crowned night herons, for example, are also expected to use this area for feeding and as a roosting site. Additionally, the River serves as suitable habitat for a variety of water-dependent reptiles and amphibians. Northern orioles and bullfrogs were observed in this area during field investigations.

Wetland No. 17 is the westernmost wetland associated with the preferred Alternative 4-M-5, consisting of a Palustrine emergent community located immediately east of Route 58. For areas, refer to FIGURE 3-3-3. The plant species composition of this area is relatively diverse, with cattail, reed grass, marsh fern, sensitive fern, wool grass, spike rush, arrowhead, yellow loosestrife, soft rush, steeplebush, and meadowsweet being present. Such woody plant species as red maple and sheep laurel occur in scattered locations along the wetland's periphery.

Wildlife observations included red-winged blackbirds, eastern kingbirds, and bullfrogs. Additional species of wildlife common to emergent wetlands, however, are also anticipated to use the area. These primarily include small mammals, reptiles, and amphibians.

ENDANGERED AND THREATENED SPECIES

According to the U.S. Fish and Wildlife Service (1986), no Federally-listed or proposed endangered or threatened species occur in the project area, with the exception of occasional transients. Based on communications with the MA National Heritage Program and MA Department of Environmental Management, State-listed endangered or threatened species also do not occur in the project area. These State agencies did, however, note the occurence of two plant species of concern located at Muddy Pond in Kingston. These species include the white-bracted boneset (Eupatorium leucolepis var. novaeangliae) and bald rush (Psilocarya scirpoides). Refer to Fighres 3-3-4 and 3-3-5.

The white-bracted boneset, presently under review for potential listing as an endangered or threatened species at the Federal level (U.S. Fish and Wildlife Service, 1980 and 1985) occurs along the northern and eastern shores of the

easternmost portion of Muddy Pond, approximately 800 ft south of the preferred Alternative 4-M-5. Approximately 2,000 individual plants are known to occur at this location. The bald rush community is located in a small open water area immediately north of the boneset population. This area occurs approximately 500 ft south of the proposed alignment.

WETLANDS EVALUATION

The U.S Army Corps of Engineers (U.S. ACOE) regulations governing the Section 404 permit program, have established general policies for the evaluation of applications for Department of the Army permits, including permits for discharges of dredged or fill material into waters of the United States (33 CFR 320.4 (b); July 22, 1982 and October 5, 1984). The determination of the effect of a proposed action on wetlands is among these policies. Criteria to be considered in the evaluation of a proposed action and its effects on wetlands were established and important wetlands were defined to include:

"i. Wetlands which serve important natural biological functions, including food chain production, general habitat, and nesting, spawning, rearing, and resting sites for aquatic or land species;

ii. Wetlands set aside for study of the aquatic environment or as sanctuaries or refuges;

iii. Wetlands the destruction or alteration of which would affect detrimentally natural drainage characteristics, sedimentation patterns, salinity distribution, flushing characteristics, current patterns, or other environmental characteristics;

iv. Wetlands which are significant in shielding other areas from wave action, erosion, or storm damage. Such wetlands are often associated with barrier beaches, islands, reefs, and bars;

v. Wetlands which serve as valuable storage areas for storm and flood waters;

vi. Wetlands (which) are prime natural recharge areas. Prime recharge areas are locations where surface and ground water are directly interconnected; and

vii. Wetlands which through natural water filtration processes serve to purify water."

Such criteria are consistent with the U.S. Environmental Protection Agency's (U.S. EPA) Section 404 (b)(1) guidelines used in the evaluation of permit applications for discharges of dredged or fill material into waters of the United States, including wetlands (40 CFR 230.41; December 24, 1980).

At the State level, wetland evaluation criteria are associated with those interests identified in the MA Wetlands Protection Act (MGL Chapter 131, Section 40) and associated regulations (310 CMR 10.00 *et seq*). These interests include:

1. Public and Private Water Supply
2. Groundwater Supply
3. Flood Control
4. Storm Damage Prevention
5. Prevention of Pollution
6. Protection of Land Containing Shellfish
7. Protection of Fisheries

Due to the inland location of the preferred Alternative 4-M-5, however, the role of project area wetlands in terms of shellfish protection is not applicable.

As indicated above, many of the Federal and State wetlands evaluation criteria are directly related. FIGURE 3-3-6 provides a summary matrix of combined Federal/State evaluation criteria pertaining to wetlands located within the preferred Alternative 4-M-5.

Based on the functional evaluation provided in FIGURE 3-3-6, wetlands of relatively low overall value consist of Wetlands Nos. 1, 2, 3, 5, 6, 7, 10, 11 and 17. The overall value of each of the remaining wetlands is moderate. Although Wetlands No. 4, 13 and 15 are characterized by high ratings in terms of one or more criteria, their relative functions with respect to other criteria reduce their overall value. While there is no specific methodology used to evaluate the functional significance of the wetland, the evaluation was based upon available data and field observations.

FLOODPLAINS

Based on floodplain maps prepared for Plymouth, Kingston, Plympton and Carver by the U.S. Department of Housing and Urban Development, lands subject to the 100 year flood within the preferred Alternative 4-M-5 are associated with Wetlands Nos. 3, 4, 8, 9, 12, 13, 14, 15 and 16. These and other floodprone areas in the region are indicated in MAP 4-I, which illustrates that many of the floodplain areas directly affected by the proposed alignment occur in sparsely developed or undeveloped areas. Additionally, the majority of floodprone areas traversed by the proposed right-of-way, including the Winnetuxet River floodway, are located in the western portion of the project area, in Carver.

The Commonwealth of Massachusetts

Executive Office of Environmental Affairs

Department of Environmental Management

Leverett Saltonstall Building, Government Center

100 Cambridge Street, Boston 02202

ILLIAM F. M. HICKS
COMMISSIONER

CHIEF ENGINEER
RECEIVED
NOV 12 1981

October 28, 1981

Justin L. Radlow
Chief Engineer
Department of Public Works
100 Nashua St.
Boston, MA 02114

Re: Proposed Route 44 relocation, Kingston, MA.

Dear Mr. Radlow:

I am writing as a result of a recent meeting between Massachusetts Natural Heritage Program (MNHP) staff and Department of Public Works personnel to discuss the proposed rerouting of Route 44, in Kingston. On September 11, 1981 John Feingold, Program Coordinator of MNHP, met with DPW's Rt. 44 project manager Gregory Prendergast to brief him on potential rare species conflicts in the Muddy Pond area. These conflicts had previously been discussed with Mr. Hartley, Mr. Prendergasts's predecessor. After a review of its ongoing inventory of the state's rarest and most endangered species and ecological features, MNHP has identified Muddy Pond as one of ten ecological sites in Massachusetts deserving highest priority for protection. On the basis of this designation, The Nature Conservancy, a national land conservation organization, is studying Muddy Pond to develop an appropriate preservation strategy. Eve Endicott, Director of the Conservancy's New England Field Office, was also present at the meeting.

As you may know, the preferred alignment for Route 44, "4-M," may have adverse impacts on the world's largest population of Eupatorium leucolepis var. novae-angliae (White-Bracted Boneset.) This rare plant's range is restricted to a few sites in Rhode Island and southeastern Massachusetts, with about 60% of its known global population located along the eastern shores of Muddy Pond. E. leucolepis var. novae-angliae was cited in the December 15, 1980 Federal Register as a taxon with first priority for proposed federal listing under the Endangered Species Act of 1973. DPW and MNHP staff have been working together since December, 1980 to try to incorporate this rare species' protection into the planning for Rt. 44.

The 4-M alignment as shown in the Draft Environmental Impact Report was field-checked by MNHP staff on March 26, 1981, raising several concerns. First, the proposed route would go through, or very close to, a pondlet just northeast of Muddy Pond. This pondlet appears to have direct groundwater connection with Muddy Pond, and is also one of two local sites for Psilocarya scirpoides, a rare species of Bald Rush. Secondly, the topography along 4-M may provide visual access to the pond shores where E. leucolepis grows. Thirdly, the topography would direct drainage from the proposed highway site towards Muddy Pond.

FIGURE 3-3-4

At the recent meeting with Mr. Prendergast, several specific recommendations [illegible] hexaclepis and P. scirpoides were discussed. These included: 1) To prevent groundwater contamination impacts - The 4-M alignment should be moved farther north into the State Forest lands to avoid the adjacent pondlet entirely, if possible. Careful study of groundwater movement in the area should be made to ascertain the effects on Muddy Pond of disturbance of the adjacent pondlet. 2) To prevent surface-runoff contamination impacts - Closed drainage should be provided along the section of highway north of Muddy Pond and the pondlet, to contain traffic wastes, road salt, and stormwater runoff. 3) To minimize physical and visual access - Vegetative screening should be maintained thus discouraging passers-by from increasing the use of the site. These concerns should be reflected in the scope and recommendations of the Final Environmental Impact Report. The Natural Heritage Program would be pleased to meet with you or your staff to discuss the recommendations for the protection of the rare species in further detail.

The development of regular coordination of MNHP with the DPW planning process was also discussed at the September 11 meeting. Early access to the Heritage Program data base, which is the only current and increasing statewide inventory of rare plants, animals, and significant ecological features, could be valuable to highwayplanners and ultimately yield substantial savings in staff time and money. The Program presently has over 2500 rare element occurrences mapped and cross-referenced in computer and manual files, the computer portion of which DPW has maintained until recently. Copies of this letter are being sent to MEPA, the Division of Forests and Parks, and the Federal Highway Administration with a request for MNHP to be included on appropriate "early coordination" mailing lists.

The Department of Environmental Management and DPW have been cooperating throughout the planning process to determine equitable compensation for DEM lands. In a letter on May 7, 1980 to DPW, former Commissioner Richard Kendall described the potential net acreage loss to Kingston State Forest from the proposed rerouting of Route 44. Please note that DEM's willingness to consider an incursion into the State Forest will be contingent upon protection of Muddy Pond and its rare species populations. Based on these considerations, we will be prepared at some future appropriate time to enter into an agreement with your Department concerning the compensating lands which will be added to the state forest and park systems as a result of the relocation of Rt. 44.

We appreciate the opportunity to be of service in this planning process and hope such cooperation will continue in the future. Please do not hesitate to call us if you have any questions.

Yours Sincerely,

William F. M. Hicks

William F. M. Hicks
Commissioner, DEM

cc: Sam Mygatt, MEPA Unit
Gilbert Bliss, Division of Forests and Parks
Norman Van Ness, Federal Highway Administration
Frank Bracaglia, Staff Specialist for Environment, FHWA
William Ashe, U.S. Fish and Wildlife Service

WFH/ASF/asf

RS 66866

Massachusetts
Natural Heritage
Program

August 4, 1983

Mr. Walter Williams
Project Development
Department of Public Works
100 Nashua St.
Boston, MA 02114

Re: Rt. 44 Alignment, Kingston

Dear Mr. Williams:

We have reviewed the plans for the latest alignment for Rt. 44 in Kingston as prepared by ~~G.E. McGuire~~ H.W. LOCHNER. So far as we are able to determine, the alignment 4M-5 is satisfactory in regards to its affect on rare species in the Muddy Pond vicinity. Relocating the alignment northward away from the pond has greatly reduced the likelihood of damage to the pondshore environment from runoff, spills, and construction.

We appreciate the opportunity to participate in the planning process and remain at your service. Feel free to contact us with any questions in the future.

Sincerely,

John E. Feingold

John E. Feingold
Program Coordinator

JEF:phb

FIGURE 3-3-5

Department of Environmental Management 100 Cambridge Street, Boston, Mass. 02202 (617) 727-3188

WETLAND EVALUATION SUMMARY

WETLAND NUMBER AND FUNCTION*

Evaluation Criterion	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Biological Functions/Fisheries	Low	Low	Low	Moderate	Low	Low	Low	Moderate	Moderate	Low	Low	Moderate	High	Moderate	Moderate	Moderate	Low
Sanctuaries/Refuges	None	None	None	None	None	None	None	** X	X	None	None	None	None	None	None	None	None
Physical/Chemical Characteristics	None	Low	Low	Moderate	None	None	None	Low	Low	None	None	Low	Moderate	Low	Moderate	Moderate	Low
Storm Damage Prevention	Low	Low	Low	Moderate	None	None	None	Low	Low	None	None	Low	Moderate	Moderate	Moderate	Moderate	Low
Flood Storage/Control	Low	Low	Low	High	Low	Low	Low	Moderate	Moderate	Low	Low	Moderate	High	Moderate	High	Moderate	Low
Groundwater Supply/Recharge	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Water Pollution Control	None	Low	Low	Low	None	None	None	None	None	None	None	None	Low	Low	Low	Moderate	Low
Public/Private Water Supply	None	None	None	Low	None	Low	Low	None	None	None	None	None	Low	Low	Low	Low	None

* None ☐
Low ▨
Moderate ▩
High ■

** Wetlands located within State Forest lands

FIGURE 3-3

4. NOISE

GENERAL INFORMATION-NOISE

Noise can have several psychological and physiological effects on people, which vary from one individual to the next. In particular, noise can interfere with sleep or with the ability to carry on a conversation without raising one's voice.

Noise levels are expressed in units of dBA - decibels on the A-weighted scale, and are found to be closely related to human perceived noisiness and noise annoyance [1,2].* FIGURE 3-4-1 shows some commonly experienced sound levels expressed in dBA. A difference of 3 dBA occurring over a period of more than a few minutes is thought by many acoustical specialists to represent a just noticeable difference. A 10 dBA increase in noise level represents a doubling of perceived noise [3].

Noise levels in the community fluctuate during the day and the night. Generally they are quieter at night than during the day when there is more activity. To describe the changing noise levels it is customary to employ some type of statistical analysis. This study considers peak traffic hour L10 noise levels, where L10 is that noise level which is exceeded 10% of the time during the peak traffic hour and is expressed in dBA. For this analysis, the peak traffic hour was determined to be the loudest hour.

Criteria used in assessing the existing, as well as the future noise climates include those set forth by the Federal Highway Administration in Federal Highway Program Manual 7-7-3 [4]. In that document the FHWA has established Noise Abatement Criteria for different land uses. As shown in FIGURE 3-4-2, most noise-sensitive land uses such as residential fall into Category B and thus qualify for a Noise Abatement Criterion of 70 dBA-L10.

In areas that are presently very quiet, noise impacts would occur if projected future traffic noise levels are substantially higher than existing noise levels, even if the projected levels do not exceed the FHWA Noise Abatement Criteria. The Massachusetts DPW has determined that a projected 15 dBA increase over existing noise levels defines a severe noise impact. This is in agreement with NCHRP Research which indicated that a 10-15 dBA increase in the L10 noise levels can be expected to result in severe noise impacts [5].

EXISTING NOISE CLIMATE

Noise measurements were taken along existing Route 44 as well as along the preferred Alternative, 4-M-5. The objectives were to determine the existing noise climate in the study area and to identify noise sensitive areas.

Noise monitoring was performed on a total of four days in June and July 1978, July 1984, and February 4, 1986. Noise monitoring was conducted at 14 areas adjacent to existing Route 44, the preferred Alternative 4-M-5, or along existing Route 3. The areas were chosen for their sensitivity to noise and proximity to existing or potential traffic noise. The purpose of the noise measurements was to quantify the existing

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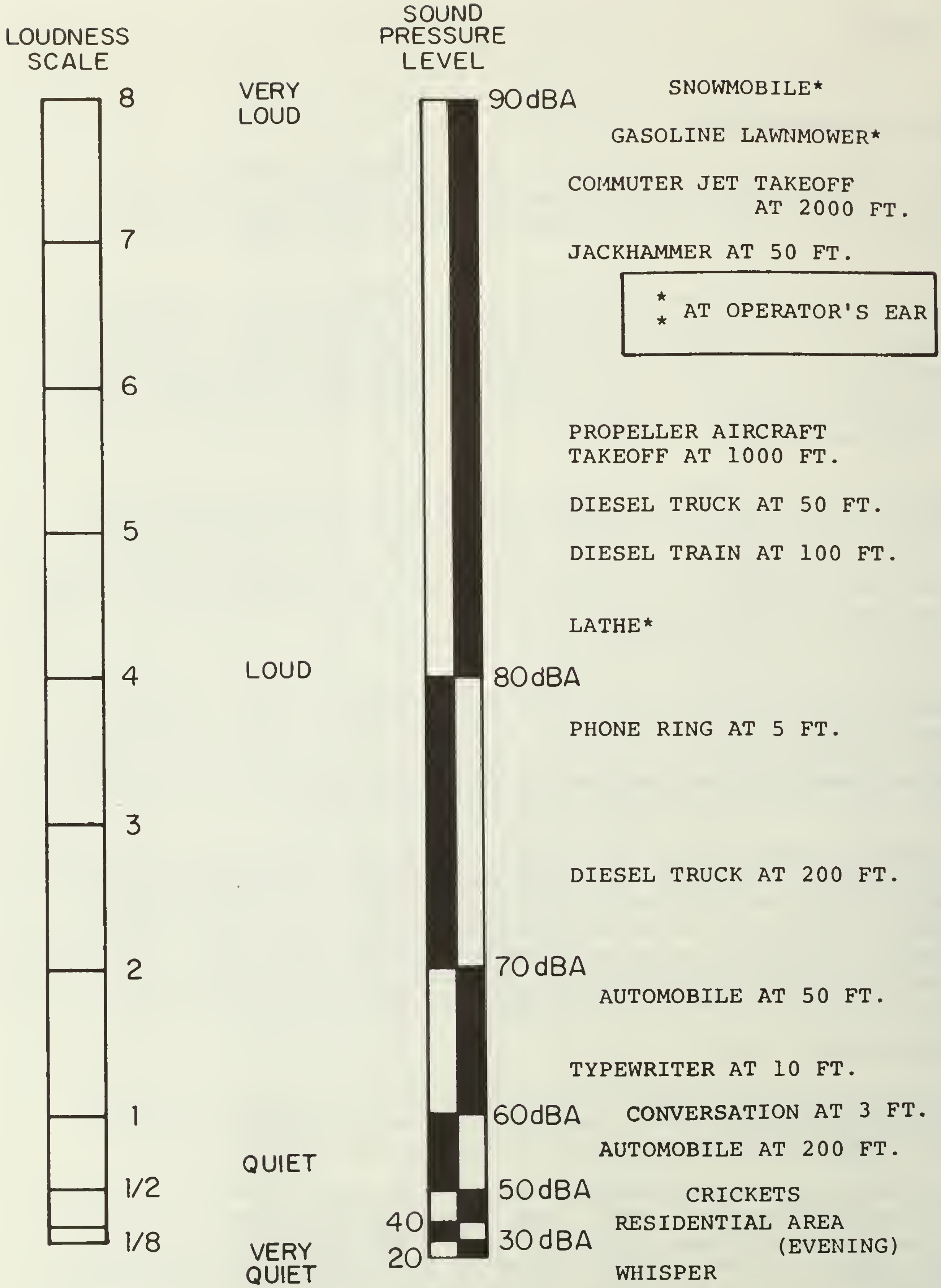
* Numbers in brackets [ ] denote the sources shown in the List of References in the Technical Appendix.



TYPICAL SOUND LEVELS IN DBA
AND THEIR SUBJECTIVE LOUDNESS.

FIGURE 3-4-1

FIGURE 3-4-2

FHWA NOISE ABATEMENT CRITERIA/LAND USE RELATIONSHIPS [4]

ACTIVITY CATEGORY	PEAK HOUR L10 DBA*	LAND-USE/ACTIVITY
A	60 dBA (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	70 dBA (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	75 dBA (Exterior)	Developed lands, properties or activities not included in Categories A and B above.
D	--	Undeveloped lands.
E	55 dBA (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

* The peak hour L10 is denoted by L10(h) in FHPM 7-7-3

acoustic environment and to provide a basis for assessing the impact of any projected noise level increases. In addition, the field work provided an opportunity to become familiar with existing patterns of land use and also to identify community noise sources other than traffic. Existing noise levels in FIGURE 3-4-3 and MAP 4-M are based on the noise monitoring program and are representative of the most noise sensitive locations of an area. All of these noise sensitive areas have only category B land use activities.

Further details of the noise monitoring procedures may be found in the Technical Appendix.

The character of the existing noise climate varies considerably within the study area due to the variation in type of land use. FIGURE 3-4-3 summarizes the existing noise levels at 14 locations, which range from 42 dBA in remote areas, to 67 dBA in residential areas near existing Route 44 and to 70 dBA in residential areas near Route 3.

In general, traffic from existing Route 44 dominates the existing noise climate at locations 4, 5, 8, and 9, where L10 noise levels range from 65 to 67 dBA. The above locations are all 50 to 100 ft. from the edge of the roadway, where there are residences, churches, and schools. At locations 1, 16, 17 and 18 in residential areas, where L10 noise levels are between 60 and 70 dBA, the noise climate is dominated by traffic on Route 3, 100-500' away.

Locations away from major roads presently enjoy a tranquil climate. The noticeable sources of sound at these locations include birds, wind, occasional light aircraft, school buses, cars, dogs barking, and children playing. Locations 7 and 11 are in this category and receive noise levels of 45 and 47 dBA, respectively. Location 15 receives noise from children at Camp Mishannock (summers only) and Location 3 receives noise from the Halliday plant in Plympton.

In summary, noise levels close to existing Route 44 and other major roads such as Routes 3, 80, and 58 are presently in the range of 60-70 dBA-L10. At measurement locations away from major roads along the preferred Alternative 4-M-5, existing noise levels are in the range of 42-47 dBA-L10.

FIGURE 3-4-3

EXISTING NOISE LEVELS: PEAK HOUR L10 (dBA)
(Based on noise monitoring in 1978 & 1984)

LOCATION (See MAP 4-M)	PEAK HOUR L10 (dBA)	REMARKS
		CORRIDOR 4-M-5
1	70	Residence, 100' from Rte. 3 and 115' from Cherry St.
3	47	Resid. 125' from Existing Spring St., 270' from Plympton/Carver Town Line.
6	42	Resid./Rural, 70' from Existing Brook St., 410' from Existing Pleasant St.
7	45	Resid./Rural, 7' from Existing Spring St., 700' north of High St.
11	47	Resid./Rural, 20' from High St., 360' from Existing Pleasant St.
15	44	Rural, Camp Mishannock at Muddy Pond, 1500' northeast of Plympton Rd.
16	60	Resid., 10' from Squanto Rd., 750' from Cherry St.
		EXISTING RTE 44
4	66	Resid., 60' from Exist. Rte. 44 near Clear Pond.
5	65	Resid., near Church on Exist. Rte. 44, 50' from Exist. Rte. 44.
8	66	Resid., 50' from Existing Rte. 44, 470' from Eaton Way.
9	67	Resid., 80' from Exist. Rte. 44.
17	61	Resid., 6' from Royal St., 500' from Rte. 3, 610' from Samoset St.
18	63	Resid., 15' from Westerly St., 270' from Rte. 3, 830' from Samoset St.
19	63	Motel, 150' from Samoset St., 600' South of Rte. 3.
20	59	Resid., 310' from Rte. 3, 2,400' South of Cherry St.

Note: All distances are approximate and are measured from the nearest side of the roadway, unless noted.

SECTION 4

ENVIRONMENTAL CONSEQUENCES

1. NATURAL FEATURES

SOILS

In addition to direct soils losses associated with roadway construction, soils will also be affected by erosion which accompanies the excavation phases of construction and by the erosion of roadway embankments prior to the establishment of vegetation. The extent of these impacts will be determined by the depth of cuts required to attain suitable roadway grades, and the sediment and erosion control measures implemented during highway design and construction. Due to the coarse, sandy/gravelly character of the majority of soils to be traversed, the potential for erosion is generally high.

During construction all slopes will be susceptible to erosion. To minimize the extent of erosion, diversion channels will be constructed above all high cuts to prevent water from washing over the face of the slopes. Where appropriate, terraced cuts will be installed on slopes. All disturbed areas will be seeded immediately upon completion of rough grading, in areas of both cut and fill.

All proposed construction activity will be confined to the right-of-way, with roadway cuts and fills being limited to those necessary for the establishment of appropriate grades. All cut and fill sites, including roadway embankments will be progressively revegetated subsequent to the completion of construction activity in a given area. The seeding and mulching of disturbed sites as soon as practicable will serve to minimize the erosion of these areas, thus limiting potential impacts to adjacent lands, and especially surface waters and wetlands. Where necessary, topsoil will be placed to further ensure the rapid revegetation of disturbed sites.

In those areas where the erosion of sediments may adversely affect surface waters and wetlands, including cranberry bogs, filter fabric fencing in conjunction with hay bale dams will be installed and maintained to curtail the transport of sediments. Such activities will be most specifically appropriate along the the proposed alignment in Carver, where the roadway is to traverse the Winnetuxet River, as well as active cranberry bogs and wetlands. However, all surface water and wetlands throughout the entire preferred Alternative 4-M-5 will be afforded the same degree of protection in terms of erosion controls.

To further mitigate impacts due to soil erosion, a series of paved sedimentation/retention basins will be constructed. These basins will allow sediment contained in highway runoff to settle prior to discharge to receiving waters. Each basin will be provided with trash racks at the outlets to prevent any rubbish from entering the streams. A solid filter baffle will also be installed across the basins, near the outlet end, as a barrier to contain runoff in the larger part of the basin and allow sediment to settle. In order for runoff to reach the outlet, the water level in the larger part of the basin will first have to exceed the height of the filter baffle.

An additional discussion of potential construction-related impacts and mitigation measures relative to surface waters and water quality is provided below in the subsection entitled SURFACE WATER AND WATER QUALITY.

TOPOGRAPHY

Topographic modifications associated with the proposed alignment pertain to the extent of cuts and fill placement. Inasmuch as possible, these cuts and fills will be limited to those required to establish suitable roadway grades.

A total of approximately 6,639,410 cubic yards (yd^3) of material will be excavated during construction. Allowing for shrinkage and unusable material, the net amount of excavation totals approximately 5,361,320 yd^3. The extent of fill required to attain suitable roadway grades totals approximately 4,209,960 yd^3. Consequently, a total of approximately 1,151,360 yd^3 of excess material will be required to be disposed offsite. This will be accomplished at suitable locations to be determined by the contractor during construction activity.

The largest single cut is to occur immediately west of the proposed Plymouth interchange. At this location, approximately 83 ft of material will be removed. Some of the areas requiring greater amounts of fill include a portion of the preferred Alternative 4-M-5/Route 3 interchange (53 ft), a roadway segment located approximately 200 ft south of Wolf Pond (43 ft), and Great Mink Hole (40 ft).

GROUNDWATER

Potential impacts to the groundwater resources of the region pertain to two basic conditions. These include alterations to the quantity of recharge which reaches the groundwater system, and the quality of that recharge.

The preferred Alternative 4-M-5 will be approximately 7 1/2 miles in length with a paved width of 76 ft. The total paved area will, thus, be nearly 65 acres, inclusive of inside and outside shoulders. This area will effectively be removed from contributing to the recharge of the regional groundwater aquifer. Due to the proposed drainage design, there will be no over the shoulder drainage from paved areas, which would allow some of the road runoff to infiltrate through adjacent soils and surficial deposits. Rather, runoff associated with the entire length of preferred Alternative 4-M-5 will be collected in a closed drainage system initially directing runoff to a series of sedimentation/retention basins, and ultimately discharging runoff into surface waters. Thus, the only opportunity for this water to reach the groundwater table will be during periods of low surface water flow at proposed discharge locations or by means of recharge induced by high volume pumping wells adjacent to streams. Due to the limited amount of paved area which is to be created, in comparison to the total area of recharge, however, impacts to individual wells and the total aquifer are not measurable.

Groundwater quality may potentially be impacted by constituents of automobile exhaust, or by deicing compounds entrained in highway runoff. However, as runoff from the proposed roadway will be directed entirely into a closed drainage system, this potential source of groundwater contamination will be

removed as a source of recharge into the aquifer. Discharges will be located downstream as well as downgradient from any existing high volume municipal or private wells. Thus, there is little potential for contamination of well water by natural or induced recharge due to roadway runoff.

The municipal well system which has been considered by Plympton, however, is located southwest of Brook Street, approximately three-quarters of a mile downstream from one of the proposed drainage discharge locations. At this location, there exists a potential for the induced movement of contaminated runoff, which is to be discharged into Annasnappet Brook, to be drawn into a high volume municipal well. Such induced recharge into the well's zone of influence would be of particular concern during low surface water flow periods. Rather than being transported downstream away from the zone of influence, such as during high surface water flow periods, surface waters during low flow periods would be more susceptible to induced recharge due to their reduced velocities. As indicated previously, however, Plympton currently has no definite plans to purchase or develop a municipal water supply system.

Due to the location of the preferred Alternative 4-M-5, as well as the closed drainage system to be constructed, potential municipal well sites identified by Plymouth and Kingston will not be affected by the proposed roadway.

SURFACE WATER AND WATER QUALITY

PHYSICAL CONDITIONS

Construction of the preferred Alternative 4-M-5 will result in the loss or alteration of a number of surface water bodies along the alignment's right-of-way. The impact areas consist of the Winnetuxet River in Carver, cranberry bogs and associated open water between Pleasant Street and Spring Street in Carver, Great Mink Hole and some very small open water sites in Kingston, and several equally small ponds near the Plymouth Industrial Park interchange and the Route 3 interchange in Plymouth.

The crossing at the Winnetuxet River will be bridged and thus will not involve any loss of open water. For the cranberry bog areas in the Pleasant Street/Spring Street area, conventional construction will result in the loss of approximately 2.8 acres of open water and result in a number of separate bog areas on either side of the roadway. However, culverts beneath the roadway will maintain the hydrologic connections between any bog areas which are separated in this way.

Open water losses in Kingston will total approximately 1.4 acres, with the majority of this loss (1.3 acres) occurring as a result of the filling of Great Mink Hole. Bridging the roadway over Great Mink Hole would cost an additional $1.8 million (approximately $1.4 million per acre of open water preserved) and is not considered practicable. This is especially true in light of this wetland's low to moderate functional value.

Finally, in the vicinity of the Plymouth Industrial Park interchange, West Cherry Street, and the Route 3 interchange in Plymouth, the 4=M-5 will eliminate a number of small kettle-hole ponds with an aggregate area

of approximately 0.5 acres. The ponds, like Great Mink Hole and the other ponds in Kingston, are primarily groundwater discharge areas and are not hydrologically connected to other surface waters. A short (300-400 ft) stretch of the brook which originates near the Route 3 interchange will also be eliminated by the new interchange. The affected stream reach begins west of Route 3 and extends to Cherry Street on the east side of Route 3.

Mitigation measures designed to minimize the above-referenced loss of open water area and drainage pattern alterations primarily consist of the narrowing of the roadway median from 100 ft to 60 ft and the installation of culverts beneath the roadway to allow the continuation of surface water flows. Reducing the median width will preserve approximately 0.8 acres of open water, while proposed culverts will assist in maintaining the hydrologic regime of affected surface waters.

CONSTRUCTION

The primary impact of the construction process on surface water quality will be a temporary increase in siltation and turbidity in those surface water bodies which lie in the right-of way of the preferred Alternative, 4-M-5, as noted above. This impact will be reflected in increased levels of turbidity, suspended solids, and color, resulting from soil erosion caused directly by construction activities and by the removal of surface vegetation during the course of construction. Nutrient levels may also increase slightly during the construction period. Also, since the dominant soils in the area are moderately to strongly acidic, eroding soils could contribute to temporary declines in pH levels of water bodies with low buffering capacities, such as the Route 3 brook and possibly the Winnetuxet River.

As indicated in the previous subsection on SOILS, however, a variety of measures will be implemented to mitigate erosion-related impacts to surface waters. These measures include diversion channels to prevent water from washing over the face of exposed slopes, the revegetation of disturbed areas, and the use of filter fabric fencing and hay bale dams. Additionally, construction will be carefully phased to limit the amount of soil exposed at any one time and to allow for the implementation of necessary control measures; the construction area will be managed by grading and other practices to minimize slopes; silt fences will be constructed on the downslope edges of exposed areas; exposed areas will be covered with mulches of straw, hay, crushed stone or gravel; and temporary catchments will be installed during construction to detain runoff and capture runoff-borne sediment.

OPERATION

During preparation of the DEIS, concern arose over possible groundwater contamination from over-the-shoulder discharge of roadway runoff, especially contamination by roadway deicing compounds (road salt). Comments received on the DEIS requested that the FEIS include a detailed consideration of a closed drainage system (i.e., a system that captures roadway runoff and delivers it to defined discharge points) for all or parts of the roadway.

Water quality impact analyses have been conducted for the following drainage alternatives:

1) Closed drainage from Route 3 west to the Annasnappet Brook/Winnetuxet River drainage divide, and open drainage into the Winnetuxet River from that point west to Route 58;

2) Closed drainage throughout the entire length of the roadway with four discharge locations: a brook at Route 3, Smelt Pond, Annasnappet Brook, and the Winnetuxet River;

3) Same as (2) above, but with discharge into Smelt Brook instead of Smelt Pond; and

4) Closed drainage throughout the entire length of the roadway with three discharge locations: the Route 3 brook, Annasnappet Brook, and the Winnetuxet River.

It was estimated in 1983 that the closed drainage system for 4-M-5 would cost $4,500,000 plus $650,000 for the retention basins, for a total of $5,150,000. By way of comparison, the conventional drainage system for Alternative 4-M-1 (which most closely approximates the alignment of 4-M-5) was estimated at $2,500,000, which included a short closed drainage system along the shores of Muddy Pond.

The last alternative has been selected as the most effective in protecting both groundwater and surface water quality. The choice of a closed drainage system, however, has resulted in impacts which are different from those usually encountered in highway water quality impact analyses. The protection of groundwater from contamination by sodium chloride by capturing it in a closed drainage system results in the capture of other pollutants which ordinarily become bound to roadside soils after draining over the shoulder and rarely become a water quality concern. These other pollutants (metals and nutrients) are thus introduced to receiving waters in runoff from a closed drainage system at higher concentrations than in runoff which has flowed over unpaved roadside areas before entering receiving waters. Also, unlike roadway deicing compounds, they are present year-round. Thus, while a closed drainage system which captures salt and other pollutants may not have serious detrimental effects on receiving water quality during high-flow periods, during summer low-flow periods more severe water quality impacts could be encountered.

Under the selected drainage alternative, runoff is discharged at the three locations shown in the following table, and runoff which had originally been intended for discharge into Smelt Pond is discharged into Annasnappet Brook. FIGURE 4-1-1 shows the roadway drainage area for each discharge point. An alternative with the same three discharge points, but with runoff from the Smelt Pond highway segment being discharged into the Route 3 brook, was considered but rejected because its requirement of three pumping stations rendered it infeasible from an engineering standpoint.

FIGURE 4-1-1

ROADWAY DRAINAGE AREAS

Area Draining To	Location of Discharge	Length (ft)
Discharge 1	Winnetuxet River	7,700
Discharge 2	Annasnappet Brook	20,900
Discharge 3	Brook at Route 3	8,600

Highway-generated pollutant loadings were obtained using the method described in Predictive Procedure for Determining Pollutant Characteristics in Highway Runoff, Volume III of Constituents of Highway Runoff, a 1981 FHWA report (FHWA/RD-81/044). This model simulates pollutant accumulation and washoff during a specified period for which accurate hourly precipitation data are available. Since the procedure is not meant to evaluate winter snow melts, only non-winter periods may be examined. The model itself is based on monitoring data gathered from five highway sites around the country during 1976 and 1977.

The lead loadings calculated by the FHWA procedure were reduced to reflect sharp decreases in the amount of leaded gasoline sold in the United States as a fraction of total gasoline sales. By 1987, the percentage of leaded gasoline sold in the nation is expected to decrease by 2/3 of the 1976-1977 percentage of 75%. To reflect this decrease, lead loadings calculated by the FHWA procedure were also reduced by 2/3, since leaded fuel is the principal source of lead in highway runoff.

Winter loadings of sodium and chloride from road salt, as shown in FIGURE 4-1-2, were obtained more directly from data supplied by MA DPW.

FIGURE 4-1-2

SALT USE IN WHITMAN SECTION, MA DPW DISTRICT 7

Year	Tons	Tons/lane-mile
1977-78	2,000	14.39
1978-79	--	--
1979-80	--	--
1980-81	2,085	15.00
1981-82	1,885	13.56
1982-83	1,470	10.58
Average	1,860	13.38

Values in the third column are based on the 139 lane-miles in the Whitman section. The low (10.58 tons/lane mile), average (13.38 tons/lane-mile), and high (15.00 tons/lane-mile) salt use rates were used in subsequent analyses.

Winter roadway runoff volumes were computed on the basis of 1.70 ft of precipitation (November through March), the average for 1941-1970 for Plymouth, and a runoff coefficient of 0.95. The resulting volumes and calculated loadings yield average winter runoff concentrations of approximately 900 to 1,300 mg/l Na and 1,400 to 2,000 mg/l Cl.

Current drainage plans call for sedimentation basins ("paved sedimentation/ retention pools") to be located at various points along the proposed Route 44. These basins would serve to remove varying amounts of highway-related pollutants from the runoff before it is discharged to surface waters. To account for this removal, loadings for the various pollutants were reduced by the percentages shown in FIGURE 4-1-3.

FIGURE 4-1-3

REMOVAL EFFICIENCIES FOR PRIMARY SEDIMENTATION

Parameter	Removal Efficiency
Lead	20.0%
Zinc	25.0%
Iron	37.0%
Cadmium	7.0%
Total Nitrogen	16.0%

Source: Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities -- 1976 Needs Survey, U.S. Environmental Protection Agency Report No. 430/9-76-010, February, 1977.

Dilution volumes were calculated for each receiving stream for winter (November through March), non-winter (April through October), and low-flow conditions. For mass balance calculations, existing water quality data (FIGURE 3-3-2) for each receiving body were used to yield average pollutant concentrations.

The results of the mass balance calculations are shown in the following FIGURES 4-1-4, 4-1-5, and 4-1-6. Winter concentrations of sodium and chloride show substantial increases over existing concentrations, except at Discharge 1, where the increases are more moderate. Resulting ambient concentrations in Annasnappet Brook are approximately fifteen to twenty-five times existing concentrations; concentrations in the Route 3 brook show a two- to three-fold increase. While the changes in sodium and chloride content in the receiving waterways may appear dramatic, they are the result of the intentional shift from over-the-shoulder drainage to a closed drainage system with subsequent discharge to a stream. Because of this change in drainage the impacts are unavoidable. However, groundwater is protected from contamination and the high salt

FIGURE 4-1-4

EXISTING AND RESULTING WINTER CONCENTRATIONS
(mg/1)

	Discharge 1 Winnetuxet River				Discharge 2 Annasnappet Brook				Discharge 3 Route 3 Brook			
	Existing	Resulting			Existing	Resulting			Existing	Resulting		
		Low	Avg	High		Low	Avg	High		Low	Avg	High
Sodium	5.1	11	12	13	5.1	82	102	114	125.0	222	253	270
Chloride	9.6	18	21	22	7.5	126	158	176	115.0	276	322	349

FIGURE 4-1-5

EXISTING AND RESULTING NON-WINTER CONCENTRATIONS

(mg/l)

	Discharge 1 Winnetuxet River		Discharge 2 Annasnappet Brook		Discharge 3 Route 3 Brook	
	Existing	Resulting	Existing	Resulting	Existing	Resulting
Lead	0.03	0.030	0.02	0.021	0.02	0.022
Zinc	0.01	0.011	0.01	0.018	0.02	0.032
Iron	1.0	1.0	1.22	1.16*	0.87	0.82*
Cadmium	0.006	0.006	0.005	0.007	0.005	0.009
Total Nitrogen	0.02	0.025	0.035	0.079	0.04	0.115
Total Phosphorus	0.085	0.085	0.134	0.133	0.03	0.040
Chloride	9.6	10.2	7.5	12.6	115.0	111.0**

* Reduced concentrations are shown because iron is generally more common in winter runoff.

** A reduction of the non-winter chloride level at this location is attributable to the high existing concentration.

FIGURE 4-1-6

EXISTING AND RESULTING CONCENTRATIONS -- ONE-YEAR THIRTY-MINUTE STORM IN 7Q10 FLOW OVER ONE DAY*

	Discharge 1 Winnetuxet River		Discharge 2 Annasnappet Brook		Discharge 3 Route 3 Brook	
	Existing	Resulting	Existing	Resulting	Existing	Resulting
Lead	0.03	0.033	0.02	0.048	0.02	0.09
Zinc	0.01	0.023	0.01	0.086	0.02	0.122
Iron	1.00	0.99	1.22	1.30	0.87	1.03
Cadmium	0.006	0.009	0.005	0.016	0.005	0.020
Total Nitrogen	0.02	0.075	0.035	0.325	0.04	0.420
Total Phosphorus	0.085	0.107	0.134	0.278	0.03	0.260
Chloride	9.6	14.3	7.5	31.5	115.0	62.0

*7Q10 - the lowest flow occurring during 7 consecutive days over any 10 year period.

concentrations in the streams will not reduce the ability of benthic biota, fish, or plants to reproduce and grow in the streams. The resulting concentrations are well within the range of concentrations tolerated by even the most sensitive of organisms inhabitating the streams.

Resulting concentrations for the non-winter period generally show little change from existing concentrations. Calculable increases occur for total nitrogen at Discharge 2, and for cadmium and total nitrogen at Discharge 3, but the resulting concentrations are still low. In contrast with winter conditions, the non-winter chloride concentrations show little change.

The low-flow, intense-storm scenario shows the highest resulting concentrations for all pollutants except chloride. This worst-case scenario reflects the maximum period of pollutant accumulation allowed by the model (20 days), followed by an intense 1-year, 30-minute storm (0.8 inches), resulting in high runoff rates and pollutant washoff. Increases at Discharge 1 (Winnetuxet River) are still moderate. Discharge 2 (Annasnappet Brook) experiences larger increases, especially for zinc and total nitrogen, both of which show approximately nine-fold increases in concentrations. The highest resulting concentrations occur at Discharge 3 (Route 3 Brook), which has the smallest natural drainage area and the lowest 7Q10 (the lowest flow occurring during 7 consecutive days over any 10 year period) flow. The sharpest increases are for zinc, total nitrogen, and total phosphorus (six to eleven-fold), with lead and cadmium showing approximately four-fold increases.

The drainage design calls for paved sedimentation-retention basins along the roadway. These basins will serve the dual function of controlling peak flows and reducing the amount of pollutants ultimately discharged to the receiving waters. They will be sized to be able to accommodate runoff from the 25-year storm event of 4.3 inches. (By comparison, the low-flow, intense-storm impact analysis used the one-year, thirty-minute storm of 0.8 inches.)

During low-flow periods the basins will capture and retain runoff from most storm events and allow pollutants to settle. In this way, runoff will be prevented from entering the receiving streams until sediment-associated pollutants have had a chance to settle and the remaining water is diluted by runoff from a large rainfall event or series of events. Each basin will also be provided with trash racks to prevent rubbish from entering surface waters. Moreover, a solid filter baffle will be installed across the basins near the outlet end as a barrier to contain runoff in the larger part of the basin and allow sediment to settle.

The proposed closed drainage system is designed to protect groundwater from roadway-associated contamination by diverting runoff to surface waters. As previously indicated, this water will be prevented from reaching the groundwater system except during periods of extremely low surface water flows. The resulting concentrations of highway-related pollutants other than sodium and chloride would be low. It is not expected that biota would be affected in any significant degree.

FISHERIES IMPACTS

As noted in Section 3, each surface water body in the Route 44 study area may be considered at least a potential habitat for a warmwater fishery. Under this assumption, each surface water body eliminated by the project also represents lost fish habitat. The total loss due to the proposed project is approximately 4.7 acres.

The most severe long-term water quality impact of the project will be changes in sodium and chloride concentrations in the Route 3 brook (FIGURE 4-1-4). The highest resulting concentration of sodium chloride is 619 mg/l. This is substantially lower than concentrations which have been shown to be harmful to freshwater aquatic life. McKee and Wolf (1971) report the results of numerous studies on the effects of sodium chloride on freshwater aquatic organisms. Threshold concentrations for toxic effects varied considerably, but were generally well above 1,000 mg/l.

Fisheries may also be affected by the water quality impacts of construction activities (increased turbidity, suspended solids, etc.). Such impacts should be limited, however, since the construction impacts themselves will be temporary and erosion control measures will be implemented.

During highway operation, potential fisheries impacts will also be mitigated by the proposed sedimentation/retention basins. These basins will allow roadway associated pollutants to settle prior to discharge to receiving waters.

WETLAND PROTECTION POLICIES

Applicable wetland protection policies at the Federal level primarily include Executive Order (EO) 11990, entitled "Protection of Wetlands". EO 11990, issued by President Carter on May 24, 1977 dictates that Federal agencies "shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use."

Wetland protection policies at the State level include the MA Wetlands Protection Act (MGL Chapter 131, Section 40) and associated regulations (310 CMR 10.00 et. seq.). According to the State statute:

> "No person shall remove, fill, dredge, or alter any bank, freshwater wetland, coastal wetland, beach, dune, flat, marsh, meadow, or swamp bordering on the ocean or on any estuary, creek, river, stream, pond, or lake, or any land under said waters or any land subject to tidal action, coastal storm flowage, or flooding . . . without filing written notice of his intention to so remove, fill, dredge, or alter, including such plans as may be necessary to describe such proposed activity and its effect on the environment and without receiving and complying with an order of conditions and provided all appeal periods have elapsed."

Revised regulations implementing the MA Wetlands Protection Act became effective April 1, 1983. These regulations, and specifically those pertaining to inland wetlands, specify interests identified in the MA Wetlands Protection Act to which areas subject to jurisdiction are presumed to be significant, as well as set forth general performance standards to be applied to activities which will affect regulated resource areas.

Local wetland protection policies primarily consist of zoning by-laws. Sections 4.4 and 11.0 of Carver's Zoning By-law (1980), for example, establish a wetland and floodplain district, with a special permit from the zoning board of appeals being required for activities proposed within the district. Project area lands subject to this by-law include Wetlands Nos. 13-17.

Section 10.54 through 10.57 of those Regulations define and set performance standards for four resource areas: banks, bordering vegetated wetlands, land under water bodies and waterways, and land subject to flooding. As indicated below in the subsection entitled "Wetlands Impacts and Mitigation Measures," the preferred Alternative 4-M-5 may not meet two of the performance standards. Specifically, Section 10.55 (4) for bordering vegetated wetlands allows a Conservation Commission to issue an Order of Conditions only for a project in which the loss of wetlands does not exceed 5,000 square feet.

In addition, Section 10.55(4) also imposes conditions for the construction of replacement wetlands. Two conditions are (1) the replacement area should have an unrestricted hydraulic connector to the same water body or waterway associated with the lost area; and (2) the replacement area should be located within the same general area of the water body, or reach of the waterway, of the lost area. The wetland replacement areas are at the extremities of the project while lost wetlands are located throughout the project. It is therefore unlikely that the above conditions will be met.

Section 10.56(4) for land under water bodies and waterways preclude Conservtion Commissions from issuing an Order of Conditions if any proposed work within this land impacts the capacity of the land to provide breeding habitat, escape cover, and feed for fisheries. As discussed above in the subsection entitled "Fisheries Impacts," each surface water body at least has the potential to be a habitat for warm water fishery. Therefore, preferred Alternative 4-M-5 may not meet this performance standard.

Because two of the wetlands performance standards may not be met, the Massachusetts Department of Public Works must seek a variance from the Commissioner of the Department of Environmental Quality Engineering.

Section VIIID of Plympton's Zoning By-laws (1984) establishes a Floodplain and Watershed Protection District. None of the preferred Alternative 4-M-5 right-of-way, however, appears to be located within this District.

In Kingston, Sections V.H and V.I of the Town's Zoning By-law (1983) address conservation restrictions and land suitability, respectively. These by-laws primarily pertain to natural water courses and ponds, floodplains, marshes, and seasonal wet areas relative to site developments. Additionally, the Town has adopted a Wetlands Protection By Law (Article XVIII) similar in scope and format to the MA Wetlands Protection Act and associated regulations. Lands associated with the preferred Alternative 4-M-5 which are subject to these by-laws include Wetlands 6-11, and that portion of Wetland 12 located in the Town of Kingston.

Section 401.02 of the Town of Plymouth's Zoning By-laws (1983) is intended to preserve and protect the Town's streams and other waterbodies, to protect people and property against the hazards of flooding and improper waste disposal, to preserve and maintain the watertable and water recharge areas, and to insure the continuation of the natural flow pattern of the water courses providing safe and adequate flood water storage and runoff capacity. Additional parts of this section address the allowed, special permit, and prohibited uses of wetlands. Project area lands subject to this by-law consist of Wetlands Nos. 1-5.

AVOIDANCE OF WETLANDS

The following discussion reviews each wetland from west to east. Refer to MAPS 4-J-1 through 4-J-14.

Wetland No. 17 is affected by ramp "D" in the southeast quadrant of the interchange of 4-M-5 and Route 58 at the beginning of the relocation of Route 44. The position of 4-M-5 is fixed at this point. Even if the starting point of the new alignment was moved 1/4 to 1/2 mile westerly and proposed Route 44 was moved to the north to avoid this wetland, other wetlands (an unnumbered wetland and Wetland No. 16) would then be affected. Cole's Mill, an historic property is south of preferred Alternative 4-M-5 and would be affected by moving the alignment south. There is no practical alternative to avoid Wetland No. 17.

Wetland No. 16 is the area on either side of the Winnetuxet River, which will be bridged by 4-M-5. The river is only 800' ± east of the point where the two eastern ramps of the Route 58 interchange merge with the through lanes of 4-M-5. Since the River is perpendicular to 4-M-5, a crossing is necessary, and so there is no alternative to avoid Wetland No. 16.

Wetlands Nos. 15, 14 and 13 cannot be avoided because the Spring Street interchange was fixed in a location to keep the highway south of the residential developments at Nel Bonney Road, on Brook Street, and north of Ricketts Pond. The other fixed point was the Route 58 interchange.

Wetlands Nos. 12, 11, 10, 9, 8, 7, and 6 cannot be avoided because the alignment has fixed points at the Spring Street interchange and at a point north of Muddy Pond which was determined for the following reasons. At the request of the Sisters of Divine Providence to move the alignment northerly away from Camp Mishannock, and the Department of Environmental Management's request also for a more northerly location away from the shores of Muddy Pond, the location of the white-bracted boneset, an endangered plant on the Massachusetts Natural Heritage list, the alignment was fixed about 400' north of Muddy Pond. This placed the highway location through Great Mink Hole (Wetland No. 9), a two acre kettlehole wetland. To avoid Great Mink Hole, the alignment would have to be moved more northerly which would then affect Pratt Pond, Wolf Pond, cranberry bogs, and would intrude further into Camp Nekon which is a Section 4(f) property. It would also introduce a reverse curve into the alignment west of Route 80.

The Plymouth Industrial Park interchange was moved to its proposed location to serve better the industries within the Park, as well as the Plymouth and Brockton Bus Co. In order to align the proposed highway from the area north of Muddy Pond to the Plymouth Industrial Park interchange, and in order to keep south of Monk's Hill, Wetland No. 5 could not be avoided. Wetland No. 5 lies

within the proposed Ramp "B" lobe area of the Industrial Park interchange. It is this lobe area that is proposed for the creation of seven acres of wetland replacement and Wetland No. 5 will not be eliminated but will become part of a large, new wetland.

The final control point for the location of the preferred Alternative 4-M-5 is its terminus with Route 3 just south of the existing Cherry Street interchange. This Route 3 interchange could not be moved northerly to avoid wetlands Nos. 3, 2, and 1 without introducing unacceptable design curves and affecting approximately 20 residences and commercial properties. To move the interchange south would further affect Wetland No. 4.

As a general observation, the wetlands are so numerous throughout the project area that it would be impossible to lay out a reasonable alignment that misses them all.

WETLANDS IMPACTS AND MITIGATION MEASURES

As previously discussed in Section 2, in accordance with E.O. 11990, none of the build alternatives evaluated therein would avoid impacts to project area wetlands. With respect to the preferred Alternative 4-M-5, its construction will also result in wetland-related impacts. Only the No Build Alternative will totally eliminate impacts to wetlands, and this Alternative was not considered practical for the reasons outlined previously in Section 2.

The following discussion addresses both wetland impacts and mitigation measures associated with the proposed Route 44 Alternative 4-M-5. Both direct and indirect wetland-related impacts are described. Impacts to wetlands are also assessed based on an evaluation of anticipated post-construction wetland values. In documenting each of these effects, the primary methodology used to evaluate impacts to wetlands is based on functional criteria.

FIGURE 3-3-3 provides the existing preconstruction acreage of each wetland community type, including active cranberry bogs, associated with the proposed right-of-way. Not all wetlands within the right-of-way, however, will be affected by roadway construction. This is, in part, due to the proposed narrowing of the median from 100 ft to 60 ft., the effect of which is to increase the distance between the right-of-way line and the toe of the embankment slope. As FIGURE 4-1-7 indicates, project implementation will result in the actual loss of approximately 28.67 acres of wetlands. The majority of these losses will occur in the Town of Carver. Approximately 18.7 acres of wetlands, which include approximately 5.2 acres of active cranberry bogs will be directly affected within this segment of preferred Alternative 4-M-5.

Coincident with the loss of wetland vegetation will be the loss of wildlife habitat, as well as reductions in the functional values associated with each specific wetland (see FIGURE 3-3-6 and FIGURE 4-1-9). Reductions in wetland vegetation and wildlife diversity and productivity, and the degree of wetland vegetative interspersion will also occur in association with project construction. Additional wetland-related impacts potentially include alterations in plant species composition and successional rates, the loss and displacement of wildlife, alterations in wildlife species composition, and the disruption and alteration of wildlife movements.

The potential also exists for highway construction to indirectly result in alterations in wetland species composition and successional rates. This is

FIGURE 4-1-7

SUMMARY OF WETLAND IMPACTS
(acres)

ROUTE 44 ALTERNATIVE 4-M-5 RIGHT-OF-WAY*

Wetland No.	Wetland Community Type**					Total Acreages Within Each Wetland	
	P-F	P-S/S	P-EM	P-OW	CB	OVERALL	WITHIN RIGHT OF WAY
Plymouth							
1			0.23	0.25		0.59	0.48
2	0.00		0.24			0.54	0.24
3	1.59					1.70	1.59
4	0.42		1.75	0.17		24.07	2.34
5			0.06	0.08		1.78	0.14
Subtotal	2.01		2.28	0.50		28.68	4.79
Kingston							
6		0.02		0.02		0.35	0.04
7			0.03			0.22	0.03
8		0.00				7.12	0.00
9		0.20		1.32		2.49	1.52
10	0.04			0.04		0.32	0.08
11		0.02				0.02	0.02
12		0.30				1.56	0.30
Subtotal	0.04	0.54	0.03	1.38		12.08	1.99
Plympton							
12		3.20				10.66	3.20
Subtotal		3.20				10.66	3.20
Carver							
13	1.75	1.15	2.78	2.83	3.86	51.03	12.37
14	0.12	0.30				5.72	0.42
15	0.82		0.65		1.30	96.81	2.77
16	2.00					76.87	2.00
17			1.13			2.64	1.13
Subtotal	4.69	1.45	4.56	2.83	5.16	233.07	18.69
Total	6.74	5.19	6.87	4.71	5.16	284.49	28.67

* Acreage calculations are based on an average width of 60 ft.

** Palustrine Forested (P-F)
Palustrine Scrub/Shrub (P-S/S)
Palustrine Emergent (P-EM)
Palustrine Open Water (P-OW)
Cranberry Bog (CB)

FIGURE 4-1-8

SUMMARY OF WETLAND IMPACTS
(acres)

ROUTE 44 ALTERNATIVE 4-M-5 RIGHT-OF-WAY*

Wetland No.	Wetland Community Type**					Total Acreages Within Each Wetland	
	P-F	P-S/S	P-EM	P-OW	CB	OVERALL	WITHIN RIGHT OF WAY
Plymouth							
1			0.25	0.25		0.59	0.50
2	0.01		0.28			0.54	0.29
3	1.64					1.70	1.64
4	0.47		2.01	0.17		24.07	2.65
5			0.09	0.10		1.78	0.19
Subtotal	2.12		2.63	0.52		28.68	5.27
Kingston							
6		0.05		0.07		0.35	0.12
7			0.06			0.22	0.06
8		0.00				7.12	0.00
9		0.26		1.32		2.49	1.58
10	0.06			0.05		0.32	0.11
11		0.02				0.02	0.02
12		0.45				1.56	0.45
Subtotal	0.06	0.78	0.06	1.44		12.08	2.34
Plympton							
12		3.60				10.66	3.60
Subtotal		3.60				10.66	3.60
Carver							
13	1.77	1.84	2.72	3.54	4.95	51.03	14.82
14	0.25	0.40				5.72	0.65
15	0.98		0.81		2.09	96.81	3.88
16	2.34					76.87	2.34
17			1.13			2.64	1.13
Subtotal	5.34	2.24	4.66	3.54	7.04	233.07	22.82
Total	7.52	6.62	7.35	5.50	7.04	284.49	34.03

* Acreage calculations are based on an average width of 100 ft.

** Palustrine Forested (P-F)
Palustrine Scrub/Shrub (P-S/S)
Palustrine Emergent (P-EM)
Palustrine Open Water (P-OW)
Cranberry Bog (CB)

POST-CONSTRUCTION WETLAND EVALUATION SUMMARY

WETLAND NUMBER AND FUNCTION*

EVALUATION CRITERION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Biological Functions/Fisheries	□	▨	□	□	▨	▨	▨	□	□	▨	□	▨	▨	▨	□	□	▨
Sanctuaries/Refuges	□	□	□	□	□	□	□	X	X	□	□	□	□	□	□	□	□
Physical/Chemical Characteristics	□	▨	□	□	□	□	□	▨	□	□	□	▨	▨	▨	□	□	▨
Storm Damage Prevention	□	▨	□	□	□	□	□	▨	□	□	□	▨	▨	□	□	□	▨
Flood Storage/Control	□	▨	□	□	▨	▨	▨	□	▨	▨	□	▨	□	□	▨	□	▨
Groundwater Supply/Recharge	□	▨	□	▨	▨	▨	▨	▨	▨	▨	□	▨	▨	▨	▨	▨	▨
Water Pollution Control	□	▨	□	▨	□	□	□	□	□	□	□	□	▨	▨	▨	□	▨
Public/Private Water Supply	□	□	□	▨	□	▨	▨	□	□	□	□	□	▨	▨	▨	▨	□

*FUNCTION

□ NONE

▨ LOW

□ MODERATE

■ HIGH

X WETLANDS LOCATED WITHIN STATE FOREST LANDS

FIGURE 4-1-9

primarily due to the sensitivity of wetland plant species to modifications of hydrologic conditions. Roadway embankments, for example, are likely to alter surface and groundwater flows, resulting in either wetter conditions or those suitable for the establishment and growth of plant species associated with more dry site conditions. Additionally, plant species introduced along the right-of-way may serve as a seed source, allowing for the introduction of these species into wetlands at a more advanced rate than would occur under normal conditions, if at all.

With respect to wildlife associated with affected wetlands, construction activities will likely result in the mortality of individuals belonging to less mobile groups of wildlife, such as small mammals, reptiles, and amphibians. The loss of wildlife habitat and displacement of wildlife species, however, are anticipated to result in more substantial impacts. The losses of wetland wildlife habitat may generally be considered tantamount to the vegetative losses cited in FIGURE 4-1-7. Consequently, approximately 28.7 acres of wetland wildlife habitat will be directly affected due to project implementation.

As noted above, some wildlife mortality may be expected during the construction process. Wildlife species capable of avoiding construction activities, however, will be displaced. Displacement refers to the movement of wildlife species from those areas altered by construction to other suitable habitats elsewhere. Depending on the species, construction may result in either total, partial, or temporary displacement. Small mammals, for example, may be totally displaced because their home ranges are characteristically small and may be completely contained within the right-of-way. However, where construction results in the loss of an area used only for feeding and cover by larger mammals and birds, for instance, whose home ranges extend over a large area, the potential displacement is considered partial. As a result, new sources of food and cover will have to be located by these species. As portions of the right-of-way begin to become revegetated subsequent to construction activities, a variety of wildlife species will eventually return to this area. Thus, displacement for some species may be considered only temporary.

However, assuming that the carrying capacity (the maximum number of a wildlife species which a certain area will support) of offsite habitats has been realized for all wetland-associated wildlife species to be displaced by the proposed project, a condition which represents a worst case situation, wildlife-related impacts will be more widespread. Rapid or large scale dispersal could, for example, result in changes in the structure (density, age distribution, sex ratio, abundance) of the balanced populations into which displaced species of wildlife emigrate (Odum, 1959). Mass dispersal and resultant "crowded" conditions could also cause increases in competition for food, breeding sites, and living space. This could, in turn, result in increased mortality rates for affected species, and particularly for those individuals displaced. Regardless, assuming that the carrying capacities of offsite habitats have been realized and all displaced individuals do not successfully relocate, no long term or permanent effects on regional wildlife populations are expected.

Construction of Alternative 4-M-5 will also result in the conversion of existing wetland vegetative resources to those typical of highway environments. Such areas are characteristically dominated by upland grasses and other herbaceous plant species, although various trees and shrubs may be

located within the right-of-way. This land use and vegetative conversion will, coincidently, result in the introduction and occurrence of wildlife species typical of such upland successional environments.

Wetland wildlife losses may be expected during highway operation, as well, particularly due to wildlife-vehicle collisions. The occurrence and frequency of such collisions have been attributed to a variety of factors, including meteorological conditions; the availability of food, cover, water, and breeding sites; behavioral responses of wildlife; daily and seasonal movement patterns; existing wildlife population levels; and the plant species composition of highway rights-of-way, among others. Although mortality among certain groups of wildlife, such as mammals and birds, may be more frequently observed, wildlife-vehicle collisions have also been documented for reptiles and amphibians.

Additionally, for those wildlife species with characteristically large home ranges, especially mammals, the presence of a highway may serve more as a barrier, resulting in their inability to reach previously utilized habitats. Highway fences reinforce this isolation.

Comparing FIGURE 3-3-6 with FIGURE 4-1-9, wetland-related impacts will be more pronounced in terms of Wetlands Nos. 4, 9, 12, 13, and 15. This is primarily due to the wetland acreage affected at each site and/or the potential reductions in functional values. As indicated in FIGURE 3-3-6 and Section 2, the overall value of each of these wetlands is moderate. Additionally, Wetlands Nos. 13 and 15 contain all of the active cranberry bogs traversed by the proposed right-of-way, i.e. approximately 3.9 acres and 1.3 acres, respectively. The drainage outfalls from the closed drainage system are located down gradient of water supplies used for Wetlands Nos. 13 and 15. A summary of the anticipated functional values for each wetland traversed by the Route 44 Alternative 4-M-5 is provided in FIGURE 4-1-9.

In terms of Wetland No. 9 (Great Mink Hole), this kettlehole wetland contains the second largest single area of Palustrine open water to be directly affected by roadway construction (see FIGURE 4-7). As shown in MAP J10, 9, 8, practically the entirety of Great Mink Hole is contained within the proposed roadway area. Consequently, this wetland will be essentially eliminated by construction activities.

No Federal or State-listed endangered or threatened species, including the white-bracted boneset and bald rush, will be affected by the preferred Alternative 4-M-5. As stated by the MA Natural Heritage Program in FIGURE 5-3-1, "the alignment 4-M-5 is satisfactory in regards to its effect on rare species in the Muddy Pond vicinity". See also, FIGURE 5-3-16.

With respect to potential secondary development impacts due to the presence of the proposed Route 44, such effects to wetlands, if any, are anticipated to be minimal. This is primarily due to the limited access provided along the preferred Alternative 4-M-5 alignment and the limited extent of wetlands in the vicinity of proposed access locations.

Access to the proposed roadway is to be provided at only four locations, including Route 58, Spring Street, the Plymouth Industrial Park, and Route 3. Only Wetland No. 4, located immediately north of Industrial Park Road, occurs within close proximity to the two easternmost access locations. Because of its topographic position approximately 20 to 30 ft below surface elevations associated with Industrial Park Road and the steepness of side slopes extending

from this roadway to the wetland, the potential development of this area is remote. Lands within close proximity of the proposed right-of-way at Spring Street and Route 58 are zoned residential. In the Spring Street area, much of these lands are already developed. Although wetlands, including those associated with the Winnetuxet River occur in these areas, zoning and land use restrictions will serve to limit wetland-related impacts resulting from any potential secondary development.

Each of the wetland-related impacts cited above is subject to potential mitigation through the implementation of a variety of measures. Wetland-related design measures primarily consist of the narrowing of the roadway median. This narrowing of the roadway median, from 100 ft to 60 ft., will preserve approximately 5.4 acres of wetlands, as can be seen by comparing FIGURE 4-1-7 with FIGURE 4-1-8. Additional design considerations, particularly in relation to wetlands, include plans for the installation of a closed drainage system, and the installation of a sufficient number of culverts or other drainage features to allow for the maintenance of existing drainage patterns. The installation of a closed drainage system will aid in reducing the quantities of roadway runoff and deicing compounds entering wetland communities. The maintenance of existing drainage patterns and the hydrologic regime of wetlands is critical to their continued value as functional communities. Therefore, facility design should minimize the disruption of such conditions and ensure an adequate number of culverts or other drainage features to allow for the sustained viability of wetlands in the project area. This is particularly crucial in the areas of Wetlands Nos. 13 and 15, to ensure a water supply connection between cranberry bogs. Such facility design measures are incorporated into the proposed Route 44 project plans.

In terms of wetlands located within the proposed right-of-way, placement of the roadway on structure rather than fill is only proposed for Wetland No. 16 (Winnetuxet River). At this site, bridging will be required to cross the Winnetuxet River and allow for the passage of River flows during periods of high water. As previously indicated, bridging Great Mink Hole alone has been estimated to cost approximately $1.8 million over conventional fill techniques. Consequently, construction of the proposed roadway on structure at this or additional locations is not practicable. A comparison of building on viaduct or fill is discussed below in the following subsection.

Construction-related measures refer to controls whose implementation will further mitigate potential wetland impacts. Such measures primarily include the limiting of construction boundaries and the area of disturbance, the placement and maintenance of hay bales and other erosion controls prior to and during construction, the revegetation and landscaping of disturbed areas and the sequencing of construction activities. Prior to construction, the construction boundaries will be carefully and clearly delineated and subsequent efforts made to limit construction activity to within these boundaries. Additionally, erosion controls, such as filter fabric fencing, hay bales and the seeding and mulching of soils which will remain disturbed for an extended period of time, will aid in maintaining the productive capability and quality of potentially affected areas. This is of particular importance in wetlands and surface waters. Where soils are to be removed the placement of excavated material in areas not to be disturbed will be avoided. The minimization of slope gradients along the right-of-way will also reduce the erosion potential and extent of affected areas, as will the revegetation and landscaping of disturbed areas as soon as possible following the completion of soil conditions for the establishment of those plant species to be introduced.

Operation and maintenance related measures include maintenance of the closed drainage system, roadway culverts, and sedimentation/retention basins. The maintenance and cleaning of the closed drainage system, including sedimentation/retention basins, will serve to ensure the effectiveness of the system in limiting wetland impacts, while similar activities relative to roadway culverts will aid to maintain existing drainage patterns and minimize hydrologic effects.

In addition to the mitigation measures described above, wetland-related impacts will also be mitigated through the creation of wetlands to compensate for those wetlands and wetland functions affected due to roadway construction. Numerous documents pertaining to the creation of wetlands, the establishment of wetland vegetation, and the subsequent use of those sites by wildlife have been published. Moreover, based on the occurrence of manmade cranberry bogs in the project area, the likelihood of wetland compensation efforts being successful is highly assured.

Generally, the most preferable and feasible sites for the creation of wetlands are upland areas within the same watershed and municipality as the wetlands to be impacted, as well as sites adjacent to existing wetland communities. Rather than disturb several scattered areas, however, it is also advisable to consolidate them whenever possible.

Several sites which met the foregoing criteria were considered as possible mitigation areas, all of which were associated with or were in close proximity to the proposed right of way. Two were selected. However, due to the extent of the wetlands to be mitigated, only a fourth of the 29 acres required could be replaced within the right of way itself. That occurs in Plymouth, in the southernmost cloverleaf of the interchange in the Plymouth Industrial Park. As shown in MAP 4-J-16, there are about 7.6 acres within that cloverleaf for mitigation, not including the wetlands already there. Since this land is entirely within the cloverleaf, no additional right of way will be required.

The other replacement area is located in Carver just north of the proposed right of way. As delineated in MAPS 4-J-15(1) and 4-J-15(2), this area of about 22 acres follows contour lines. However, in order to facilitate acquisition of this land and the description of its boundaries, straight lines have alse been drawn on those MAPS, encompassing an additional 13 acres, approximately, for a total of about 35 acres in this location.

In summary, the 2 replacement areas total about 29.6 acres (which is about 0.9 acres in excess of the wetland areas to be affected), and there are an additional 13 acres approximately to be acquired, for a grand total of about 42.6 acres.

In addition to compensating for wetland effects on an acreage basis, each wetland mitigation site will also function to replace those values associated with wetlands impacted by the preferred Alternative 4-M-5. These functions include public/private water supply, groundwater recharge, flood control and storm damage prevention, the prevention of pollution and protection of fisheries, and wildlife habitat. It is estimated that the cost of creating replacement wetlands will be approximately $1,200,000, based upon similar recent experience by the Department of Public Works. This figure is the sum of the following estimates: $825,000 for the wetland in Carver, $275,000 for the wetland in Plymouth, and $100,000 for archaeological investigations.

Wetland creation at these sites basically involves the conversion of upland areas to wetlands by means of soil removal/excavation to elevations at or below groundwater levels. Topsoil and/or wetland soils are subsequently spread over the sites to provide a suitable substrate for wetland vegetation. A variety of plant stocks, including seeds, rhizomes, root stocks, propagules, vegetative cores, or individuals or clumps of fully developed wetland plant species may then be used to revegetate the newly created wetlands. Maintenance/management of these area is subsequently conducted to ensure the success of wetland creation efforts. Orders of Conditions issued by local Conservation Commissions require that the Department of Public Works manage the wetlands for three years after their construction.

As final design plans for the proposed roadway have not been completed, there are not presently available site specific wetland mitigation plans, such as the types, numbers and locations of species to be revegetated. These plans will, however, be prepared as part of the project's wetland permitting processes prior to project implementation.

While the wetland creation plan will serve to mitigate project-related impacts to wetlands, this plan will affect upland vegetation and wildlife communities. The majority, if not all, of these environmental effects will be associated with the most westerly mitigation site. In this area, approximately 22 acres of upland forest and wildlife habitat will be converted to wetlands. Similar to the construction of the proposed Route 44 Alternative 4-M-5 itself, wetland creation at this location will also displace wildlife species. Some mortality of the less mobile wildlife can also be expected. Given that the easternmost wetland replacement area, to be located within the most southerly proposed cloverleaf associated with the Plymouth Industrial Park interchange, primarily consists of disturbed lands due to sand and gravel mining operations, the environmental impacts resulting from wetland creation activities in this area are anticipated to be negligible.

With respect to potential social and economic issues, wetland mitigation plan impacts primarily pertain to land use alterations and plan implementation costs. As with environmental effects, socioeconomic impacts will, for the most part, be associated with the westernmost mitigation area. At this location, existing residentially zoned lands will be converted to wetlands. In conjunction with archaeological investigations required prior to construction activities, implementation of the wetland mitigation plan in Carver is estimated at approximately $925,000.00. Due to the location of the easternmost mitigation area within the Alternative 4-M-5 right-of-way, no social-related impacts are anticipated. Wetland creation costs in this area, however, are estimated to be approximately $275,000.00

Each of the wetland mitigation measures referenced above will be incorporated into the design, operation and maintenance of the preferred Alternative 4-M-5. Regardless of the mitigation measures implemented, however, wetland impacts will, nonetheless, result from highway construction. Such unavoidable adverse impacts primarily include the loss of wetland vegetation, wildlife and wildlife habitat; reductions in the diversity and productivity of wetland vegetation and wildlife; reductions in the extent of wetland interspersion and edge habitat; the conversion of existing wetland resources to those typical of a highway right-of-way; the displacement of wildlife species; and the alteration of wildlife movements. Construction of the preferred Route 44 Alternative 4-M-5 is also expected to result in such indirect wetland effects as alterations in

plant and wildlife species composition; increased concentrations of deicing compounds and traffic-associated pollutants at each of the proposed discharge locations; and the increased occurrence of wildlife-vehicle collisions.

The Department of Public Works has consistently conferred with local, state and federal agencies while seeking resolution of issues pertaining to the natural features of the affected area. It has met with the Conservation Commissions and other officials in each of the four towns, with the Environmental Protection Agency, Fish and Wildlife Service, Department Environmental Quality Engineering, and others. Refer to Section 8, "Comments and Coordination" for a chronological list of such meetings.

COMPARISON OF VIADUCT AND FILL

Building on structure has been mentioned as a means of mitigating damage to wetlands caused by the construction of a highway. However, there exists some doubt as to whether construction on fill is more damaging than construction on piles, and whether the increase in cost (construction costs, maintenance costs and the difference in projected life) is justified by the benefits.

Use of either fill or a viaduct requires major construction and has accompanying impacts: turbidity, erosion, noise, etc. The area that fill occupies is unavailable for wetland vegetation or for wildlife habitat. However, a viaduct will shield the area under it from both sun and rain, which is not only very disruptive to growth of wetland vegetation, but also much less suitable as wildlife habitat. The viaduct would require a somewhat small land taking, since the embankment fill would have slopes.

The difference in cost is large. Viaduct on piles is estimated to cost $65 per square foot, while conventional earth fill is estimated to cost $15 per square foot. The costs of viaduct vs. embankment was estimated for three wetland areas: Wetland #17 - viaduct $5,800,000 vs $900,000 for embankment; Wetland #13 - viaduct $13,500,000 vs $1,200,000 for embankment; and Wetland #9 - viaduct $2,350,000 vs $560,000 for embankment.

Maintenance costs for a viaduct are also much higher, since the structure itself, and not merely the roadway, must be maintained. Routine maintenance work on the underside of the steel structural members, such as rust removal and painting would cause some damage to the wetlands in the immediate vicinity of the structure. A viaduct would also expose more of the road (underside as well as top) to freezing weather, requiring additional applications of deicing chemicals during the winter months, thereby increasing maintenance costs. The projected normal life span of viaduct structure is 50 years, while that of an embankment is 100 years, introducing an additional cost of earlier replacement for the viaduct.

It has been determined that a closed drainage system, located in the median, will be used throughout the project area. Foundations of suitable materials will be required to support various pipes, ranging from 12 to 48 inches in diameter including the water within them. Therefore wetlands in the median will have to be excavated and backfilled to accommodate these drainage pipes.

If viaduct structures were to be used to span the wetland areas, the drainage pipes would either have to be laid on a proper foundation or supported from the structure. If excavation and backfill for foundations were used, wetlands would then be either bisected or diminished to such a degree that the amount

and value of the wetlands would be reduced substantially. If a viaduct is used, then the drainage pipe must be supported by the structure. This additional weight, of up to a 48 inch diameter pipe filled with water, would require that the viaduct members be strenthened considerably, increasing the already high cost of viaduct construction.

Based on the above considerations it has been determined to build the proposed highway on embankment in the wetland areas rather than on a viaduct structure.

WETLAND FINDING

Based upon the above considerations, it is determined that there is no practicable alternative to the proposed new construction in wetlands and that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use.

FLOODPLAINS

At the Federal level, Executive Order (EO) 11988, entitled "Floodplain Management", was issued by President Carter on May 24, 1977. The intent of EO 11988 is to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Floodprone areas are also regulated at the State and local levels through the MA Wetlands Protection Act and associated regulations, and municipal zoning by-laws, respectively.

As with wetlands, none of the build alternatives evaluated in the DEIS would avoid impacts to flood hazard areas. Floodprone-related impacts will also be associated with the construction of the preferred Alternative 4-M-5. Although, as previously described, significant efforts were conducted since publication of the DEIS to minimize floodplain and other environmental concerns, there are no practicable alternatives which would not adversely impact floodprone areas. Only the No Build Alternative will totally eliminate potential floodplain area impacts.

Although each wetland to be affected by project implementation likely serves to store flood waters, only Wetlands No. 3, 4, 8, 9, 12, 13, 14, 15, and 16 have been designated by the U.S. Department of Housing and Urban Development as lands subject to the 100-year flood. Based on the acreage data presented in FIGURE 4-1-7, wetland/floodplain sites within the construction area total approximately 26.5 acres. This figure, thus, constitutes potential floodprone area losses resulting from construction activities within the right-of-way of preferred Alternative 4-M-5.

The majority of these losses will occur in Carver, specifically in association with Wetland No. 13. This area constitutes approximately 46.7% of the total floodplain area losses by the project.

Due to the location of many floodprone sites in sparsely developed or undeveloped areas, as well as the implementation of mitigation measures, however, such potential floodplain-related impacts as increased downstream flooding and storm damage is expected to be minimal. Nonetheless, all flood storage volumes displaced by the preferred Alternative 4-M-5 will be compensated for as required under the MA Wetlands Protection Act and associated regulations.

Moreover, many of the mitigation measures relevant to wetlands are also applicable to floodplains. For example, the narrowing of the median from 100' to 60', which reduced the loss of wetlands, will also reduce the loss of floodplains. In addition, other measures will be applied such as the installation of roadway culverts, limiting of construction boundaries and areas of disturbance, and the provision of compensatory flood storage. Each of these measures will directly or indirectly serve to reduce potential floodprone area impacts and will be incorporated, to the extent practicable, into final roadway design. As final design plans have not been completed, specific data pertaining to flood storage volume reductions resulting from construction of the proposed alignment, as well as calculations regarding the provision of compensatory flood storage are not presently feasible. These data will be generated during the project's final design phase with provisions for appropriate flood storage compensation being documented, as well. Based on the proposed wetland mitigation plan, however, much if not all of the requisite compensatory flood storage is anticipated to be provided by wetland creation activities.

2. NOISE IMPACT ANALYSIS

TRAFFIC NOISE CALCULATIONS

Future traffic-generated noise levels were calculated for locations along the preferred Alternative 4-M-5 and also adjacent to new roadways in the two interchanges with Route 3. The purpose of the traffic noise calculations was to provide a quantitative basis for assessing the likely noise impacts for 4-M-5 and near the Route 3 interchanges. All calculated noise levels are expressed in L10-dBA and are shown as the future noise levels on MAP 4-M. These traffic noise projections were calculated for two alternative future conditions: with Route 44 relocated to 4-M-5; and also with Route 44 remaining in its present alignment.

Traffic noise levels were calculated using the FHWA computer model, Snap 1.0 [6] based on the FHWA Highway Traffic Noise Prediction Model [7]. Documentation for the SNAP 1.0 computer model issued by FHWA indicates that it complies with the requirement of FHPM 7-7-3 paragraph 10 [4]. The SNAP model calculates traffic noise levels based on input data describing the roadway geometry and the traffic characteristics — volume, speed, etc. Details of the SNAP model and the traffic volumes, etc., used for calculating the traffic noise levels may be found in the Technical Appendix. At areas for which noise barrier analysis was conducted, noise reduction estimates are based on either the STAMINA II/OPTIMA computer model of a preliminary analysis of the shielding geometry. Both incorporate principles of the FHWA Highway Traffic Noise Prediction Model. [7,9].

Traffic noise levels were calculated at 14 noise sampling areas. In addition, L10= 60 and 70 dBA noise contour locations were calculated for the preferred Alternative 4-M-5. These contour locations were used in the analysis to locate noise impacted land areas.

METHOD OF ASSESSMENT OF LIKELY NOISE IMPACT

The following methodology was employed in the assessment of environmental noise impacts for the preferred Alternative 4-M-5 and the Route 3 interchanges:

- Calculate projected traffic noise levels at representative noise sensitive locations.

- Compare the projected noise levels with existing noise levels and FHWA Noise Abatement Criteria to identify potentially impacted areas.

Noise measurements were used to identify potential noise sensitive receptor sites. Projected traffic noise levels were calculated for these sites. These traffic noise projections were used to identify noise impacted areas by application of the criteria summarized on FIGURE 4-2-1.

Further details of the noise impact assessment procedures may be found in the Technical Appendix.

FIGURE 4-2-1

CRITERIA FOR TRAFFIC NOISE IMPACT

PROJECTED PEAK HOUR L10 NOISE LEVEL	IMPACT
INCREASE OF 15 dBA OR GREATER ABOVE EXISTING NOISE LEVEL	SEVERE IMPACT
69 dBA OR GREATER	APPROACHES OR EXCEEDS FHWA NOISE ABATEMENT CRITERIA FOR RESIDENTIAL AND OTHER CATEGORY B LAND USES.

PREFERRED ALTERNATIVE 4-M-5 IMPACT EVALUATION

In general, relocation of Route 44 to the preferred Alternative 4-M-5 will result in a major new noise source being introduced into areas which currently enjoy a very quiet environment, such as residential areas, and a State Forest which is used for passive recreation.

If Route 44 is not relocated, and assuming traffic volumes increase over the next 20 years as projected, there will be a corresponding increase in noise levels in areas along Route 44, which already experience considerable noise. Note that even if Route 44 is relocated, noise levels along existing Route 44 will continue to be high, although somewhat diminished due to truck traffic being attracted to the new road. All of these noise-sensitive areas have only Category B land use activities.

FIGURE 4-2-2 lists the existing and predicted noise levels at 14 locations for the No-Build and Build Alternatives. It also lists the number of units impacted near each location. All of these units except one, a motel, represent residences. In addition to these residences, others along Existing Route 44 will continue to receive significant noise.

Location 1, a residential area near the Route 3/Cherry Street Interchange, currently receives noise levels of 70 dBA-L10 and is projected to receive levels of 70 dBA-L10 for the No-Build Alternative and 73 dBA-L10 for the Build Alternative for the year 2000. These levels equal and exceed the FHWA Noise Abatement Criteria of 70 dBA-L10 for Category B Land Use/Activities. There are 12 residences in this area. Location 16 is east of the existing Route 3/ Cherry Street Interchange. There are three residences in the immediate vicinity subject to noise from either the existing ramps or proposed connectors, Connector A and Connector B. Since the proposed connectors are further away from the residences than the existing ones, these residences will receive less noise from the preferred Alternative 4-M-5. At this location, it will have noise levels of 61 dBA-L10, whereas the existing and future No-Build Alternative will have noise levels of 60 and 63 dBA-L10 respectively.

Location 15 is at Camp Mishannock, south of the preferred Alternative 4-M-5. With the existing and future No-Build Alternative, this site will have noise

FIGURE 4-2-2

EXISTING AND FUTURE NOISE LEVELS (L10-dBA)

LOCATION [1] (See MAP 4-M)	# OF RESIDENCES OR UNITS REPRESENTED	EXISTING NOISE LEVELS (1984)	PROJECTED FUTURE NOISE LEVELS NO-BUILD ALTERNATIVE (YEAR - 2000)	BUILD ALTERNATIVE (YEAR - 2000)
1	12	70**	70**	73**
3	2	47	47	59
4	11	66	72**	69***
5	10	65	72**	66
6	7	42	42	62**
7	6	45	45	57
8	8	66	68	67
9	6	67	68	63
11	6	47	47	61
* 15	1	44	44	47
16	5	60	62	61
17	7	61	65	67
18	6	63	68	70**
* 19	1	63	72**	70**
20	60	59	68	68

* Location 15 is a Girls' Camp.
Location 19 is a Motel.

** Denotes a noise impact according to criteria in FIGURE 4-2-1.

*** This increase is not attributable to relocated 44, which is nearly 2 miles away from this location. The increase is caused entirely by increased traffic on existing Route 44, due to projected development in areas tributary to it.

Note 1: Locations are not numbered consecutively because several which applied only to rejected Alternatives were omitted in the Final EIS.

levels of 44 dBA-L10, and with 4-M-5, it will have levels of 47 dBA-L10. Location 3, a residential area, is 125 feet from existing Spring Street and is north of the proposed Spring Street Interchange. The noise levels for the existing and future No-Build Alternative will be 47 dBA-L10 for both years. The noise level with the preferred Alternative 4-M-5 will be 59 dBA-L10. Neither Location 15 nor Location 3 meets criteria in FIGURE 4-2-1 for a noise impact.

Location 7 is at the southwesterly quadrant of the proposed Spring Street interchange. This area will receive 45 dBA-L10 with the existing and future No-Build Alternative and 57 dBA-L10 with the preferred Alternative 4-M-5 and does not meet the criteria on FIGURE 4-2-1 for an impact. Construction of houses was taking place in this area at the time of preparation of this text. Further development directly adjacent to the right-of-way would undoubtedly be subject to a noise impact.

Location 6, a rural residential area, is located near Brook and Pleasant Streets. With the No-Build Alternative, noise levels will not change over the existing levels of 42 dBA-L10. With the preferred Alternative 4-M-5, noise levels are projected to be 62 dBA-L10, an increase of 20 dBA. This increase is identified as a severe impact (see FIGURE 4-2-1).

Location 11, rural, residential in nature, is located near High Street and is south of 4-M-5. The existing and future No-Build Alternatives are both 47 dBA-L10, and levels for 4-M-5 are 61 dBA-L10. Neither Alternative meets the criteria on FIGURE 4-2-1 for an impact.

Locations 4, 5, 8, and 9 along existing Route 44 have noise levels between 65 and 67 dBA-L10. Location 4 will have an impact with either 4-M-5 or the No-Build Alternative with noise levels of 69 and 72 dBA-L10, respectively. At Location 5, there will be a noise impact for the future No-Build Alternative which has levels of 72 dBA-L10, 6 dBA more than for 4-M-5. At Locations 8 and 9, there are no noise impacts for either the future No-Build Alternative or 4-M-5, and the levels for the No-Build Alternative will be 1 and 5 dBA more than for 4-M-5.

Locations 17 and 18 are residential and are at the northern quadrant of the proposed interchange at existing Route 44 and Route 3, and of the two, Location 18 is closest to Route 3. The existing noise levels at Locations 17 and 18 are 61 and 63 dBA-L10, respectively, and those for the No-Build Alternative are 65 and 68 dBA-L10. The levels for 4-M-5 at Locations 17 and 18 are 67 dBA-L10 and 70 dBA-L10, respectively. The latter represents an impact and meets the FHWA Noise Abatement Criterion of 70 dBA-L10 for Category B Land Use/Activities. Location 19, a motel is in a business area at the southern quadrant of the proposed interchange at existing Route 44 and Route 3. The existing noise levels are 63 dBA-L10. Both the future No-Build Alternative and 4-M-5 will have impacts with levels of 72 and 70 dBA-L10, respectively.

Location 20 is a new development of twelve buildings, each with five condominiums and is located along the northbound side of Route 3. See MAP 4-M. The existing noise levels are 59 dBA-L10. See FIGURE 4-2-2. This area receives some protection from traffic noise by earth berms along the northbound side of Route 3. It is recommended that the existing earth berms be retained and connected with another earth berm to increase noise attenuation for the buildings. If the existing earth berms remain at the same heights, the noise levels will be 68 dBA-L10 for both the No-Build Alternative

and preferred Alternative 4-M-5. However, if the earth berms are connected to one berm, the noise levels will be 63 dBA-L10 in both cases.

MITIGATING MEASURES FOR TRAFFIC NOISE

In accordance with FHPM 7-7-3, alternative abatement measures were considered to assess their effectiveness in reducing the predicted design year noise levels to acceptable levels in the preferred Alternative 4-M-5 and at the two proposed interchanges. These alternative measures include traffic management, alteration of vertical or horizontal alignments, and construction of noise barriers. Potential traffic management strategies include traffic control devices; signing for prohibition of certain vehicle types; time/use restrictions for certain vehicle types; modified speed limits, and exclusive lane designations. Other than the regulated speed limit at 55 mph, traffic management measures are not possible for the proposed Route 44. Design considerations which dictate the feasibility of altering the vertical alignment include the topography, sight distance, aesthetics, economics, and drainage. These considerations pertinent to the selection of the horizontal alignment include avoiding property takings and minimizing environmental impacts from proposed Route 44. In view of these considerations, it would not be feasible to alter the alignments to reduce traffic noise. Overall, noise barriers were considered as the most practical approach to mitigating noise at impacted areas in this project and are discussed in detail by impact area. These areas are listed in FIGURE 4-2-2 and are shown on MAP 4-M.

NOISE IMPACT AREA 1

Nine of the 12 residences in this area are projected to receive traffic noise in the range of 70-75 dBA-L10, thus equalling or exceeding the FHWA Noise Abatement Criterion of 70 dBA-L10. These residences presently receive 66-71 dBA-L10, so that the projected increase is 3-4 dBA. See FIGURE 4-2-2. The projected future noise levels are the same whether or not the project is built since almost all of the noise comes from Route 3.

PROPOSED MITIGATING MEASURE

It is proposed to construct a noise barrier wall along the east side of Route 3 to reduce the traffic noise for these residences. Six of the nine residences with projected traffic noise impacts would receive a noise reduction benefit of five or more decibels from a wall.

A noise barrier wall could be constructed for a distance of 905 feet along the east side of Route 3, STA. 17 + 50 - 26 + 50, approximately. (See MAP 4-M-1.) This wall would be 14 feet above the road for a distance of 255 feet, STA. 17 + 50 - 20 + 00, 17 feet above the road for a distance of 500 feet, STA. 20 + 00 - 25 + 00, and 14 feet above the road for a distance of 150 feet, STA. 25 + 00 - 26 + 50 and would end at the Cherry Street bridge. This barrier would provide a noise reduction benefit of nine decibels for two residences, six decibels for two residences, and five decibels for three residences.

The approximate cost of the wall would be $164,000. The cost of the barrier is approximately $41,000 for each of the four houses that would receive a six dBA or more noise reduction. In terms

of the seven houses overall that would receive a benefit, the cost of the wall would be about $23,000 per house. Analysis assured concrete barrier due to the right of way width along existing Route 3. During design, the feasibility of fitting in an earth berm will be explored to reduce the cost of the barrier.

It would also be possible to have the wall continue over the Cherry Street bridge. With this extension three houses would each receive a one decibel higher noise reduction. However, the bridge would require special construction to provide for the wall. The cost of this construction would outweigh the slight noise reduction benefit these houses would receive. Therefore, it is proposed that the wall should end at the Cherry Street bridge, STA. 26 + 50.

NOISE IMPACT AREA 6

This area is located along Brook St. just north of Relocated Route 44. This area presently enjoys a very quiet ambiance with noise levels of approximately 42 dBA-L10. Traffic noise from Relocated Route 44 would increase the noise exposure by 16 dBA or more for seven residences, which are projected to receive noise in the range of 58-64 dBA-L10.

The preferred Alternative 4-M-5 would be built on fill here. One possible way to reduce the traffic noise would be to construct a noise barrier wall along the edge of the roadway.

PROPOSED MITIGATING MEASURE

It is proposed to construct a noise barrier for a distance of 1610 feet, 1510 feet of which would be on top of two proposed earth berms basically located 50 feet from the edge of the road on the north side of Route 44. One hundred feet of the barrier would continue over the Brook Street bridge. (See MAP 4-M-2.) The top of the barrier would be at an elevation 16 feet above that of the roadway. The barrier would be 12 feet high for a distance of 630 feet, STA. 119-125, 16 feet high for a distance of 100 feet, STA. 125-126, and 10 feet high for a distance of 880 feet, STA. 106-134 + 70. This barrier would provide a noise reduction benefit of eight decibels for one residence, six decibels at three residences, five decibels at two residences, and four decibels at one residence, and would limit the maximum noise level increase to 12 decibels.

The approximate total cost of the barrier would be about $216,000. The cost of the barrier would be about $54,000 for each of the four houses that would receive a six dBA or more noise reduction benefit. In terms of the six houses that would receive a five dBA or more noise reduction benefit, the cost of the wall would be $36,000 per house. The cost of earth berms has not been included since the fill needed would be taken from excavation on the job.

NOISE IMPACT AREAS 17 AND 18

This is the residential area adjacent to the northern quadrant of the proposed improved interchange at Routes 3 and 44 at Samoset Street. With the projected traffic volume increases on Route 3, residences in these areas are projected to receive at least a 4-5 dBA increase with both 4-M-5 and the No-Build Alternative. (See FIGURE 4-2-2). The noise levels in these areas will increase from the existing levels of 61 and 63 dBA-L10 to projected levels of 65-68 dBA-L10 in the year 2000 without the interchange. With the proposed interchange, the noise levels would be slightly higher (2-4 dBA) at several residences due to the closer proximity of traffic on the ramps. The highest projected noise level at any residence is 70 dBA-L10.

This condition could be alleviated by constructing a noise barrier along the east side of the on-ramp (Ramp B). The barrier should extend along the ramp for a distance of about 1000 ft., from STA. 6, near Royal St., to STA. 16, near where the ramp completes its merge with Route 3. See MAP 4-M-3. The ramp is partially in cut and partially on fill here. A combination earth-berm and wall appears to be feasible. The top-of-wall elevation should be approximately 15 ft. above Ramp B.

For preliminary cost estimating purposes it is assumed that the noise barrier would consist of a 15 ft. high wall for the first 400 ft. (STA. 6-10), where the ramp is built on fill. The remaining 600 ft. of the barrier (STA. 10-16), where the ramp is in cut, would consist of a wall 8 ft. high above a combination of berm and cut, with the top of berm 7 ft. above Ramp B.

The estimated cost of the first 400 ft. of wall (15 ft. high) is $72,000. The estimated cost of the remaining 600 ft. long combination of berm and cut topped by an 8 ft. high wall is $58,000. Thus the total estimated cost for this noise barrier is $130,000.

It is estimated that the four houses closest to the road would receive a 12-15 decibel noise reduction from this noise barrier. A further four houses would receive a 5 dBA noise reduction. The cost of the barrier is thus approximately $32,500 for each of the four houses that would receive a 12-15 dBA benefit. In terms of the eight houses overall that would receive a benefit, the cost of the wall would be about $16,000 per house.

PROPOSED MITIGATING MEASURE

It is proposed to construct a noise barrier along the east side of Ramp B for a distance of approximately 1000 ft. from the vicinity of Royal St. (STA. 6) to the ramp connection to Route 3 at STA. 16. See MAP 4-M-3. The top-of-barrier elevation should be 15 ft. above the ramp pavement. The most feasible approach appears to be a 15 ft. wall in one section and a combination of cut and berm topped with a wall for the rest of the barrier. The total estimated cost is $130,000. Eight houses are projected to receive noise reductions in the range of 5-15 dBA with four of these receiving a 12-15 decibel reduction. The cost of the noise barrier per house receiving a noise reduction benefit is thus $16,000 per house.

NOISE IMPACT AREA 19

There is a motel located on the south side of Samoset St. next to the southbound Ramps C and D of the proposed improved interchange. Various parts of this motel receive noise from Route 3 and from Samoset St., with the loudest exposure presently being 63 dBA-L10. This noise is projected to increase to 70 dBA-L10 with 4-M-5 and to 72 dBA-L10 with the future No-Build Alternative. In terms of the L10 noise measure, the dominant noise sources are Samoset St. and the main line of Route 3. The contributions from Ramp C and D are relatively insignificant at the motel. Thus, the noise level at the motel is relatively unaffected by the project.

PROPOSED MITIGATING MEASURE

No mitigating measure is proposed because the future projected noise level at the motel is 2 dBA lower with the Build Alternative than with the No Build Alternative.

CONSTRUCTION NOISE MITIGATION

According to FHPM 7-7-3 [4], Paragraph 11, the following steps are to be performed with regard to mitigation of noise from construction activity:

"a. Identify land uses or activities which may be affected by noise from construction of the project. The identification is to be performed during the project development studies.

"b. Determine the measures which are needed in the plans and specifications to minimize or eliminate adverse construction noise impacts to the community. This determination shall include a weighing of the benefits achieved and the overall adverse social, economic, and environmental effects and the cost of the abatement measures.

"c. Incorporate the needed abatement measures in plans and specifications."

Critical noise receptors for the Route 44 project would include all of those potential impact areas shown on MAP T. Another potentially critical area is the residential neighborhood along Spring St. near preferred Alternative 4-M-5. This area will involve considerable earthwork and other construction activity. All of these critical residences and other land uses are close enough to construction activity that they could receive significant noise from earth-moving equipment, etc. In addition, all residences located along those local roads that will be used as haul routes should be considered as critical receptors.

Contract Plans and Specifications will include the following requirements with respect to construction noise control.

- Locate contractor staging areas at least 200 ft. from any residence or other critical receptor, and further if possible.

- Do not use any diesel or gasoline engine equipment unless it is fitted with an exhaust muffler in good working condition.

- Do not operate any equipment outside of certain specified hours, say 7 am to 7 pm weekdays.

3. AIR QUALITY

INTRODUCTION

Although there are no permanent air quality monitoring stations in the study area, its air quality can generally be considered good. The primary reason is that much of the area is undeveloped open space. The Massachusetts Department of Environmental Quality Engineering specified that 1-hour and 8-hour background CO concentrations of 3.0 ppm and 1.0 ppm, respectively, be used in this analysis. The primary transportation-related air pollution within the study area is expected to be concentrated along the major highway corridors. Carbon monoxide concentration projections were made utilizing existing traffic and meterorological conditions.

Considering air quality on a much broader scale, the U.S. Environmental Protection Agency (EPA) has determined that the photochemical oxidant concentrations in the northeastern part of the United States are presently high. The EPA has classified many of the northeastern states, including Massachusetts, as a "Non-Attainment Area" for photochemical oxidants, which signifies that the National Ambient Air Quality Standard for ozone is not being met. The contribution of the transportation-related activities in the study area to the overall photochemical oxidant concentrations is minute.

The purpose of this air quality analysis is to assess and quantify any potential air quality impacts due to the traffic generated by the proposed relocation of Route 44, and to identify any conditions which may be in violation of either the Massachusetts or National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO). The principal pollutants associated with transportation activities are CO, unburned non-methane hydrocarbons (NMHC), and oxides of nitrogen (NO_x). NMHC and NO_x, in turn, react with sunlight to form ozone.

Because highway vehicles are the prime source of CO and they also produce nearly half of the total NMHC and NO_x emitted annually, most air quality investigations for highway projects are primarily concerned with these three pollutants. The pollutants and their effects are described below.

> Carbon Monoxide is a colorless and odorless gas. Most carbon monoxide in urban areas is produced by the incomplete combustion of carbonaceous fuels. Transportation activities account for the major portion of carbon monoxide emissions. In man, carbon monoxide is absorbed by the lungs where it combines with the hemoglobin of the blood, reducing its oxygen-carrying capacity. As a result, the central nervous system is affected, with impairment of time judgment and visual acuity. Long term exposure at high levels damage the heart and the brain. The NAAQS for CO is 35 parts per million (ppm) for one hour or 9 ppm for eight hours, not to be expected more than once per year.
>
> Non-methane hydrocarbons (NMHC) themselves do not have direct detrimental effects, but are important as a precursor to ozone. Over half of all NMHC emissions are the result of automotive engine exhaust and evaporation.

Nitrogen Oxides are produced when fuels are burned at high temperatures. The nitrogen oxides of pollution importance are nitric oxide (NO) and nitrogen dioxide (NO^2). Nitric oxide is not considered to have any adverse effects at concentrations in the atmosphere. Nitrogen dioxide has an effect on the respiratory system and has resulted in increased rates of bronchitis among exposed people. It is also one of the components in the formation of photochemical oxidants, as discussed above. The NAAQS for NO_x (indicated by NO2) is 0.05 ppm, not to be exceeded more than once per year.

Photochemical oxidants are the products of chemical reactions in the atmosphere involving precursor pollutants. The most prevalent of these oxidants is ozone, also known as smog. Not directly emitted into the atmosphere, ozone is the result of the chemical reaction that occurs when NMHC and NO_x react with sunlight. A summer season pollutant, ozone is not limited to an urban, or local area. Because the precursors require time to produce ozone, impacts may not be felt for 50-100 miles downwind from the sources. Adverse effects of overexposure to ozone include respiratory damage and eye irritation. Control of the precursor pollutants will limit the levels of ozone produced. The NAAQS for ozone is .12ppm over a one hour period.

CRITERIA

The target date for attainment of the NAAQS was December 31, 1982, under the provisions of the 1977 amendments to the Clean Air Act. In specific cases where it can be demonstrated to the Environmental Protection Agency (EPA) Administrator that attainment of the national primary ambient air quality standard for ozone or CO (or both) is not possible by that date, the attainment deadline may be extended to December 31, 1987. Massachusetts is one of these "non-attainment areas" that has received such an extension. Massachusetts is also a "non-attainment area" for ozone. Plympton, Kingston, and Carver are in attainment for CO, and Plymouth is unclassified for CO.

Under the Clean Air Act Amendments of 1970 and 1977, all states are required to submit a State Implementation Plan (SIP) for attaining and maintaining the National Ambient Air Quality Standards set by EPA. Transportation Control Plans (TCPs) are required for any Air Quality Control Region where controls on stationary sources, such as power plants and other industries, combined with Federal new car emission standards, are inadequate to ensure attainment or maintenance of the NAAQS for CO and ozone. The Commonwealth of Massachusetts has adopted a SIP which includes transportation control measures, and which was approved by EPA on Nov. 9, 1983.

The FHWA has determined that both the transportation plans and the Transportation Improvement Programs (TIP) conform to the SIP. This project is included in the TIP for the Old Colony Planning Council and the Southeastern Regional Planning and Economic Development District. Therefore, pursuant to 23 CFR 770, this project conforms to the SIP. The air quality analysis was coordinated with EPA and the MA. Department of Environmental Quality Engineering (DEQE).

To demonstrate compliance with the NAAQS for CO, a microscale (local) analysis was performed. In a microscale analysis, sensitive receptors within the study area are identified and detailed traffic data are compiled. Using air quality

modeling techniques, estimates of CO levels at these sensitive receptors are made for all project alternatives and analysis years. The predicted CO concentrations are then compared with the NAAQS.

A mesoscale (areawide) analysis was also performed to assess the regional air quality impact of the preferred Alternative 4-M-5. In a mesoscale analysis, the total pollutant burden for CO, NMHC, and NO_x is estimated by calculating the emission levels for each pollutant, following which, comparisons are made between alternatives and study years.

Both the microscale and the mesoscale analyses were performed for the 1984 existing conditions and for both the No-Build and 4-M-5. Alternatives for the years 1990 and 2000.

MICROSCALE ANALYSIS AND IMPACTS

The 1- and 8-hour CO concentrations were calculated for "worst-case" traffic and meteorological conditions at a number of sensitive receptors in the project area. These receptors were chosen in consultation with DEQE and represent locations where the highest CO concentrations are expected. They include the nearest residences as well as places to which the public has access. FIGURE 4-3-1 contains the list of receptors chosen. As shown on MAP 4-L the receptors are linked to the following four specific locations, as agreed to by DEQE and MDPW.

1. The overpass at Brook Street (New Route 44)

2. Spring Street Interchange (New Route 44)

3. New Route 3 Interchange at Cherry Street.

4. Improved interchange, Route 3 at Samoset Street.

The EPA MOBILE-3 computer model was used to calculate vehicle emission rates. The traffic data used were based on existing traffic volume counts and projections developed by the MA. Department of Public Works (MDPW). Carbon monoxide concentrations were estimated using the FHWA CALINE-3 computer model. CALINE-3 is a Gaussian line source dispersion model which employs inputs related to emission rates, traffic volumes, roadway and site geometry, and meteorological conditions. The Technical Appendix contains further discussion of the input data and modeling procedure.

FIGURE 4-3-2 gives the results of the 1-hour and 8-hour analyses. All concentrations are well below the NAAQS. Concentrations decrease from 1984 to 1990 and are nearly constant between 1990 and 2000. Relative to the No-Build Alternative, CO levels for the preferred Alternative 4-M-5 are unchanged at the Spring Street interchange and the Brook Street overpass. CO levels are unchanged or slightly higher for the new interchange at Route 3 and Cherry Street, and they are unchanged or slightly lower for the improved interchange at Route 3 and Samoset Street.

FIGURE 4-3-1

SENSITIVE RECEPTORS FOR THE ROUTE 44
MICROSCALE ANALYSIS

LOCATION	RECEPTOR NO.	DESCRIPTION
Spring St. Interchange (4-M-5)	11	Residence north of Spring Street
	12	Residence south of Spring Street
Overpass at Brook Street (4-M-5)	21	Residence at Brook Street, north of overpass
	24	Residence at Brook Street and High Street, south of overpass
New Route 3 Interchange (Cherry St.)	32	Building north of interchange near Route 3
	34	Building north of interchange on Cherry Street
	36	Residence east of interchange near Route 3
	37	Building southeast of interchange on West Cherry Street
Samoset Street Interchange	41	Motel southwest on interchange on Samoset Street
	42	Sunoco station at interchange on Samoset Street
	43	Residence on Westerly Street north of interchange
	46	Residence at Royal Street and Samoset Street
	48	Building on Summer Street near Route 3
	49	Building south of interchange near Route 3

FIGURE 4-3-2

ESTIMATED CO CONCENTRATIONS
FOR THE ROUTE 44 PROJECT

RECEPTOR NO.	1984 EXISTING	1990 NO-BUILD	1990 BUILD	2000 NO-BUILD	2000 BUILD
	CONCENTRATIONS* BY YEAR AND ALTERNATIVE				
	1-Hr. (8-Hr.)	1-Hr. (8-Hr.)	1-Hr. (8-Hr.)	1-Hr. (8-Hr.)	1-Hr. (8-Hr.)
11	3.0 (1.0)	2.0 (1.0)	2.0 (1.0)	1.2 (1.0)	1.2 (1.0)
12	3.0 (1.0)	2.0 (1.0)	2.0 (1.0)	1.2 (1.0)	1.2 (1.0)
21	3.0 (1.0)	2.0 (1.0)	2.0 (1.0)	1.2 (1.0)	1.2 (1.0)
24	3.0 (1.0)	2.0 (1.0)	2.0 (1.0)	1.2 (1.0)	1.2 (1.0)
32	5.7 (1.6)	3.9 (1.4)	3.9 (1.4)	3.1 (1.4)	3.1 (1.4)
34	3.8 (1.2)	2.8 (1.2)	2.8 (1.2)	1.7 (1.1)	1.7 (1.1)
36	4.6 (1.4)	3.1 (1.3)	3.1 (1.3)	2.3 (1.3)	2.3 (1.3)
37	4.4 (1.3)	2.8 (1.2)	3.1 (1.3)	2.0 (1.2)	2.3 (1.3)
41	4.1 (1.3)	2.8 (1.2)	3.1 (1.3)	2.0 (1.2)	2.3 (1.3)
42	5.3 (2.0)	4.7 (1.6)	4.7 (1.6)	3.6 (1.6)	3.6 (1.6)
43	5.4 (1.6)	3.9 (1.4)	4.2 (1.5)	3.1 (1.4)	3.1 (1.4)
46	6.8 (1.9)	4.4 (1.6)	4.4 (1.6)	3.1 (1.4)	3.1 (1.4)
48	5.7 (1.6)	3.4 (1.3)	3.6 (1.4)	3.1 (1.4)	3.1 (1.4)
49	8.2 (2.2)	5.0 (1.7)	5.0 (1.7)	4.7 (1.8)	4.5 (1.8)

*Concentrations are in parts per million (ppm). All 1-hour results include a CO background value of 3.0 ppm in 1984, 2.0 ppm in 1990, and 1.2 ppm in 2000. All 8-hour results include a background value of 1.0 ppm for all years.

The lack of impacts at either the Spring Street Interchange or the overpass at Brook Street is to to the relatively light traffic in the area. The slight rise in CO levels near the new Route 3 interchange reflects the additional traffic induced by relocating Route 44. The corresponding slight decrease in CO levels near the Samoset Interchange is due to traffic diverted from existing Route 44 (Samoset Street) to the preferred Alternative 4-M-5. However, all these impacts are very small.

MESOSCALE ANALYSIS AND IMPACTS

The total pollutant burdens of CO, NMHC, and NO_x in tons per year were estimated for the study area. The total pollutant burdens were calculated by multiplying the annual Vehicle Miles Traveled on each of the major roadways in the study area, including relocated Route 44, by the appropriate emission factor. MAP 4-L identifies the roadway links considered in the analysis. The traffic data used in the computations were based on existing traffic volume counts and projections developed by MDPW. The emission factors were computed using the MOBILE-3 model. FIGURE 4-3-3 shows the results of the mesoscale analysis.

The Technical Appendix contains further discussion of the input data for the mesoscale analysis.

FIGURE 4-3-3

SUMMARY OF MESOSCALE ANALYSIS

YEAR	ALTERNATIVE	ANNUAL VMT*	EMISSIONS BY POLLUTANT (TONS PER YEAR) CO	NMHC	NO_x
1984	Existing	72,450,500	2439	253	311
1990	No-Build	85,093,200	1576	154	244
	Build (4-M-5)	84,744,000	1332	145	258
2000	No-Build	112,163,400	1750	137	237
	Build (4-M-5)	112,520,300	1362	126	253

*Vehicle Miles Traveled. The roadways considered include: Relocated Route 44 (when applicable); existing Route 44; Route 58; Plymouth Road; Centre Street; Wenham Road; Carver Road; Samoset Street; Route 3; Cherry Street; Mayflower Street; Brook Street; Route 80; Gate Street; Spring Street; High Street; Parting Ways Road; and Smith's Lane. Refer to MAP 4-L for the identification of the roadway links.

The pattern of impacts over time is the result of two opposing trends: increasing amounts of vehicle travel due to regional growth, and decreasing emission rates due to the Federal Motor Vehicle (Emissions) Control Program (FMVCP) and the Massachusetts vehicle inspection and maintenance program (I/M). The FMVCP requires emission controls on vehicles; by the middle 1990's nearly all vehicles on the road will be so equipped. The I/M program began in

1983 and would not have reached full impact by 1984, but would have well before 1990. Therefore, vehicle emission rates drop considerably between 1984 and 1990, but less from 1990 to 2000. This trend in emissions is greatest for NMHC and least for CO. The growth in traffic volumes is evident in the VMT projections, and higher traffic volumes also entail lower predicted speeds. The result of all trends is that for a given alternative, CO emissions decrease from 1984 to 1990 and then increase in 2000. Emissions of NMHC and NO_x decrease continuously with time. The impact of 4-M-5 relative to the No-Build Alternative, is to decrease NMHC emissions but to increase NO_x emissions. Both impacts are small, and stem primarily from the increased travel speeds afforded by the new roadway facility.

In accordance with MDPW and DEQE SIP policy, the existing park-and-ride lot at Cherry Street will be replaced following construction, in order to retain its transportation benefits and emission reduction credits.

CONSTRUCTION IMPACTS

Construction of the project will cause a temporary increase in air pollution levels during the period of construction. The short-term effects on air quality will include: an increase in particulate matter and nitrogen oxide emissions due to the usage of heavy diesel construction machinery; an increase in the corridor emissions due to the decreased speeds; and an increase in particulate matter due to fugitive dust stirred up by the movement of construction equipment together with the exposure of soils. These increased particulate matter levels will be the largest component of the air quality impact from these activities and perhaps of greatest annoyance to residential areas located near the construction site.

Dust control measures will be taken during construction to minimize impacts from particulate matter. Dust control will be maintained through application of water or other dust palliative in areas designated by the resident engineer. Dust covers will be required on all trucks hauling borrow to and from the construction site.

4. RELOCATION

INVENTORY OF STRUCTURES

An inventory of properties whose acquisition places them in the relocation workload is presented in Figures 4-4-1 (Residences) and 4-4-2 (Businesses). Information was obtained from Assessors' records and field inspection. Of the total of 28 affected properties, 22 are residential, 5 are commercial, and 1 is both residential and commercial. Fifteen are in Plymouth, 12 in Carver, and 1 in Plympton. None is vacant. Thirteen in Plymouth are affected by the Route 3/44 interchange improvement, as presently designed; and 2 are affected by the interchange in the Plymouth Industrial Park.

Only 13 are affected by the relocation of Route 44 itself. Twelve are in Carver and one in Plympton; all but 4 are affected by the interchange at Spring Street. These numbers pertain only to those properties in the relocation workload; severed parcels, or land only, are not included.

It should be noted that while these data are valid as of April, 1986, residential development continues to take place, particularly in Carver, so that the ultimate number of relocations may be higher. During approximately the last 18 months, for example, 8 houses have been constructed within the right of way in Carver on Spring Street, some of which are so recent that local official records on them are not available.

DESCRIPTION OF AFFECTED HOUSEHOLDS AND BUSINESSES

To establish the context for the required relocation, selected data for the affected census tracts were compiled along with comparable data for Plymouth County. See FIGURE 4-4-3 the U.S. Bureau of the Census does not report statistics by census blocks for these areas. Over 90% of the housing units in the Carver and Plympton census tracts are owner occupied, while fewer than 50% of the dwellings in the Plymouth census tracts are owner occupied. With the exception of the Plympton census tract, the median value of owner occupied units is \$4,000 - \$5,000 below the median value for the County. Plympton, with a median value of \$51,400 is \$3,000 above the median for the County. The median rents for each of the four affected census tracts (ranging from \$168 to \$216) are all below the County median of \$226.

The median income for the Carver and Plympton census tracts is higher than the median for the County, whereas the Plymouth census tracts are each below the County median by more than \$5,000. Similarly, Carver and Plympton have lower percentages of families below the poverty level than the County. (4.6% and 5.7% respectively, compared with 6.8% for the County). The Plymouth census tracts, with 8.9% and 9.1% of families below the poverty level, exceed the County level.

To identify potential relocation problems, information was gathered on the characteristics of affected households (FIGURE 4-4-4) and businesses (FIGURE 4-4-5). Sources for this information include the Plymouth Assessor's office, Plymouth Annual Census, Carver Assessor's office, Carver Town Street List (Town Clerk's office), and the Plymouth County Registry of Deeds.

The available information indicates that the residential properties to be acquired are primarily single family, owner occupied houses. Owners appear to

be middle income families of average size. Three elderly households and one female-headed household were identified; eight other households were identified. Available information indicates that the other households are primarily one and two person households. Ten residents under the age of 18 were identified. Since available information indicates that no family had more than four members, special relocation measures to accommodate large families are not anticipated.

NEIGHBORHOOD CHARACTERISTICS

CARVER

The Spring Street and Brook Street Areas are relatively new subdivisions of single family houses on wooded lots. With Carver's increasing development, there are many comparable houses in similar subdivisions.

PLYMOUTH

The Westerly Road/Royal Street Area is a residential enclave of well-kept single family homes. It is adjacent to Route 44 and is relatively isolated from other neighborhoods.

The two Nathaniel Street buildings, which are bounded on the east by Route 44 and on the north by undeveloped land, are relatively isolated.

The Nicks Rock Road Area is characterized by single family residences that range in condition from fair to good.

Plymouth continues to experience a high rate of growth and there are many other houses to fill relocation needs.

HOUSING MARKET CHARACTERISTICS

To determine the availability of comparable replacement housing in the Plymouth Area, real estate listings in the "Old Colony Memorial", a weekly newspaper serving the local area, were tabulated. (FIGURE 4-4-6). The selected sample included houses for sale and apartments for rent during the first six months of 1984 only. As FIGURE 4-4-6 indicates, 100 houses were included in the sample.

While many of the houses included in the sample listings exceeded the price range of the affected houses, during the six month period, over 30 houses offered for sale were within the same range. A comparison of the price and size of affected houses and houses offered for sale indicates that, over a one-year period, there would be an ample supply of comparable property. See note on FIGURE 4-4-7.

Sample listings of rental properties indicated that numerous apartments were available in the Plymouth area with rents comparable to the median rents for the affected census tracts.

The number of housing starts has been somewhat erratic in Carver and Plymouth during the past five years; however, there was a sizable increase in the number of building permits issued in Plymouth in 1983. (FIGURE 4-4-8). See note on FIGURE 4-4-7.

The Housing Authorities in Plymouth, Carver and Kingston have the following numbers of dwelling units for the elderly: 273, 20 and 48 respectively.

SUMMARY

The relocation of 28 properties, of which 22 are residential, 5 commercial, and 1 residential/commercial. Fifteen of the 28 are in Plymouth, of which 10 homes and 3 businesses are affected by the improvement of the Routes 3/44 interchange at Samoset Street. However, further study of this interchange in the design period may result in a reduction of the number of properties affected.

Twelve of the 28 total are in Carver and 1 in Plympton. Eight of those 12 and the 1 in Plympton are affected by the relocation of Spring Street as part of the interchange at that Street. The remaining four in Carver are affected by the right of way for the highway itself.

It is reasonable to assume that with normal turnover in the housing market and the current rate of new construction, comparable replacement housing and apartments could be obtained within the Carver-Plymouth area. Since no minority families or large households were identified, no special measures or services will be necessary.

Two structures, on Richards Road in the Plymouth Industrial Park, constructed in 1984, are located within the right of way for the connector road ramp in the S.E. quadrant of the interchange within the Park. One is a microwave tower owned by Blue Cross/Blue Shield and the other is an office/warehouse building occupied by Ceeco Corporation. Further studies will be conducted during the design phase to fully assess the impact to these two structures and many mitigation measures that could be taken to save them.

Further study will be given during the design period to the location of ramps serving the interchange in the Plymouth Industrial Park in order to avoid the Blue Cross/Blue Shield microwave tower and the Ceeco Corporation building. The tower would be difficult to relocate because of the state and federal regulations for such facilities, as well as technical considerations involved.

The Noonan-Leyden Press, located near the present Route 3/44 interchange on Samoset Street, could consider a site within the Industrial Park. Unlike the residential market, it is more difficult to determine whether normal turnover in commercial real estate can accommodate a relocated gas station, auto repair shop, and dog kennel.

FIGURE 4-4-1

INVENTORY OF AFFECTED RESIDENCES

Town	Address	Description	Number of Bedrooms	Occupancy	Condition	Assessed Value
CAR	56 Brook Street	A	NA	O	Good	$ 41,370
CAR	Brook Street	A	NA	R	Good	$ 27,900
CAR	74 Brook Street	A	NA	O	Good	$ 41,630
CAR	90 Brook Street	A	NA	O	Good	$ 41,340
CAR	Spring/High Street	A	NA	O	Good	N.A.
CAR	3 Spring Street	A	NA	O	Good	N.A.
CAR	Spring Street	A	NA	O	Good	N.A.
CAR	7 Spring Street	A	NA	O	Good	N.A.
CAR	Spring Street	A	NA	O	Good	N.A.
CAR	11 Spring Street	A	NA	O	Good	N.A.
CAR	Spring Street	A	NA	O	Good	N.A.
CAR	15 Spring Street	A	NA	O	Good	N.A.
PLY	104 Nicks Rock Road	A	3	O	Fair-Good	$ 39,300
PLY	23 Nathaniel Street	A (Also Kennel)	6	O	Fair-Good	$ 72,910
PLY	122 Westerly Road	A	2	O	Good	$ 42,190
PLY	114 Westerly Road	A w/Brick Veneer	3	O	Good	$ 57,660
PLY	109 Westerly Road	A	2	R	Good	$ 32,860
PLY	112 Westerly Road	A	2	O	Good	$ 45,260
PLY	18 Royal Street		3			$ 34,450
PLY	Westerly Road	A	4	O	Good	$ 36,250
PLY	16 Royal Street	A	4	O	Good	$ 37,630
PLY	14 Royal Street	A	3	O	Good	$ 20,950

Sources: Assessor's records, field inspection

Key:

R = Address of owner different from address of building
A = Single family, wood frame
O = Owner occupied
NA = Not Available
CAR = Carver
PLY = Plymouth

FIGURE 4-4-2

INVENTORY OF AFFECTED BUSINESSES

Name or Type	Address	Location	Notes
Auto Repair	Spring Street	Plympton Residence	Also single family Assessed Value $41,370)
Noonan/Leyden Press	Samoset Street	Plymouth	
American Oil Company	111 Samoset Street	Plymouth	
Dog Kennel	Nathaniel Street	Plymouth	
BC/BS Microwave Tower	Richards Road	Plymouth	
Ceeco Corporation	Richards Road	Plymouth	

Partial Takings:

8 10 Mayflower Sand & Gravel, Nicks Rock Road, Plymouth *
9 23 Pleasant Mountain Pet Rest, 83 Liberty Street, Plymouth **

Source:

* The Mayflower Sand and Gravel operation of selling sand and gravel will be severely impacted by the taking of 66 acres from the total of 91 acres.

** A narrow taking amounting to 0.01 acres from the 0.83 acre Pleasant Mountain Pet Rest Cemetery does not appear to affect any pet graves. If any graves are within the area of taking, they will be re-interred in another area of the cemetery.

FIGURE 4-4-3

1980 CENSUS DATA SUMMARY

Category	Carver 5441	Plymouth 5302	Plymouth 5303	Plympton 5431	Plymouth County
Total Population	4,177			1,974	
Total Housing Units	1,347	1,399	1,788	618	59,925
Owner Occupied Units	1,111	644	773	557	41,213
Percent of Total	93.4%	48.6%	45.4%	93.5%	
Renter Occupied Units	78	680	929	39	7,175
Owner Occupied Housing Values Median	42,900	43,000	44,000	51,400	48,000
Rent (Median)	216	168	202	216	226
Housing Units - Year Built					
1979 - March 1980	45	17	60	39	2,210
1975 - 1978	366	15	25	103	9,220
1970 - 1974	441	58	55	132	19,887
1960 - 1969	93	103	214	94	23,518
1950 - 1959	97	119	88	27	18,167
1940 - 1949	55	112	148	27	10,678
1939 or Earlier	182	975	1,189	196	47,490
Income Distribution - Households	1,205	1,327	1,675	601	132,886
Less than 5,000	74	207	285	37	14,142
5,000 - 7,499	41	152	177	26	8,961
7,500 - 9,999	78	113	149	34	9,346
10,000 - 13,999	161	257	349	74	19,052
15,000 - 19,999	240	149	262	117	19,680
20,000 - 24,999	304	172	156	92	19,037
25,000 - 34,999	179	194	150	147	24,329
35,000 - 49,999	101	65	106	56	12,905
50,000 +	27	18	41	18	5,434
Median Income	20,121	13,425	13,230	20,601	18,749

FIGURE 4-4-3

1980 CENSUS DATA SUMMARY - (CONTINUED)

Category	Census Tracts: Carver 5441	Census Tracts: Plymouth 5302	Census Tracts: Plymouth 5303	Census Tracts: Plympton 5431	Plymouth County
Families Below Poverty Level	50	83	91	30	
Percent	4.6%	8.9%	9.1%	5.7%	6.8%
Education - High School Graduates (%)	81.6%	55.7%	68.5%	84.5%	79.1%
Age					
65+	170	609	892	115	
Occupation in Selected Industries					
Employed Persons 16+	1,647	1,463	1,681	853	175,768
Managerial & Professional	303	214	375	247	44,366
Tech., Sales, Admin., Support	526	465	569	226	54,693
Service	209	181	318	65	24,103
Farming	56	14	48	22	1,928
Precision Production	249	250	135	148	23,335
Operators, Fabricators	304	339	236	145	27,343
Manufacturing	338	387	202	204	37,574
Wholesale and Retail Trade	402	358	436	140	40,267
Professional and Retail Services	319	217	484	209	39,308

Source: U.S. Bureau of the Census, 1980

FIGURE 4-4-4

DESCRIPTION OF HOUSEHOLDS

Town	Address	No. of Resi-dents	Names of Residents	Age	Occupation	Date of Last Sale	Approximate Purchase Price
CAR	56 Brook Street	3	Alberghini, Robert	41	Bog Worker	1982	0
			Alberghini, Carol	34	Bank Teller		
			Alberghini, Michelle	18	Student		
CAR	Brook Street		N.A.			1980	4,000
CAR	74 Brook Street	2	Robinson, Theodore	33	Des. Draftsman	1977	31,900
			Robinson, Shirley	30	Waitress		
CAR	90 Brook Street	3	Vickers, Ruth	57	Tel. Operator	1977	29,400
			Smith, Catherine	36	Housewife		
			Smith, Kenneth	38	Police Officer		
CAR	Spring/High Street	NA	DeSilva	NA	NA	NA	NA*
CAR	3 Spring Street	3	Sweetser, Cynthia	31	Operator	NA	NA*
			Sweetser, Donald J.	36	Manager	NA	
			Sweetser, David J.	12			
CAR	Spring Street	NA	Roulier, Mark	NA	NA	NA	NA*
			Roulier, Michele	NA	NA	NA	
CAR	7 Spring Street	NA	Horton, Janet	NA	NA	NA	NA*
			Horton, Sandra	NA	NA		
CAR	Spring Street	4	Terranova, Joseph R.	31	Plate Maker	NA	NA*
			Terranova, Cheryl A.	29	Shipping Clerk		
			Terranova, Geannine	8			
			Terranova, Lisa	7			
CAR	11 Spring Street	4	Teller	NA	NA	NA	NA*
CAR	Spring Street	2	Rowell, Mark	33	Technician	NA	NA*
			Rowell, Karen	25	Technician		
CAR	15 Spring Street	NA	Doherty, Robert W.	NA	NA	NA	NA*
PLY	Spring Street	2	Harper, Paul			1970	14,500
			Harper, Elaine				
PLY	104 Nicks Rock Road	4	Coombs, John Jr.	41	Technician	1976	20,500
			Coombs, Brenda	36	Pixley-Richards		
			Coombs, Joseph	18			
			Coombs, Tricia	14			

FIGURE 4-4-4 (continued)

DESCRIPTION OF HOUSEHOLDS

Town	Address	No. of Residents	Names of Residents	Age	Occupation	Date of Last Sale	Approximate Purchase Price
PLY	23 Nathaniel Street	6	Tocci, Glenn	27	Kennel Owner	1977	70,000
			Tocci, Celeste	23	At Home		
			Tocci, Monica	2	At Home		
			Burt, Hamson	60	Truck Driver		
			Pimental, Robert	14	Student		
			Wall, Evelyn	74	Kennel Owner		
PLY	122 Westerly Road	2	Parker, Edward G.	75	Retired	1954	200
			Parker, Iride M.	72	At Home		
PLY	144 Westerly Road	3	Bobblis, Parker J.	50	Security	1979	52,000
			Bobblis, Barbara	43	Bank Officer		
			Bobblis, Lisa	17	Student		
PLY	109 Westerly Road		(Kierstead-Owner)			1980	N.A.
PLY	112 Westerly Road	2	Santos, Joseph	80	Retired	1979	45,000
			Santos, Mary	77	Retired		
PLY	18 Royal Street		Hibsch, Gary				
PLY	Westerly Road	2	Diodato, Richard	52	Retired	1960	4,000
			Diodato, Mary	--			
PLY	16 Royal Street	4	Hoffer, Dennis P.	32	Coast Guard	1982	32,000
			Hoffer, Christine	35	At Home		
			Hoffer, Eric	5			
			Hoffer, Jason	2			
PLY	16 Royal Street		Gascoyne, Monique	28	Bartender		
			Gascoyne, Matthew	4			
PLY	14 Royal Street	2	Gropman, William F.	84		1982	10,000
			Gropman, Judith	84			

Source: Registry of Deeds, Plymouth Annual Census, Plymouth and Carver Assessor's office, Carver Town Street List.

Code: CAR = Carver
PLY = Plymouth
NA = Not Available

* Local sources have estimated the purchase price of these recently constructed houses to be in the range of \$100,000 to \$130,000.

FIGURE 4-4-5

DESCRIPTION OF AFFECTED BUSINESSES

Business Name Location	Owner/Renter	Type	S.I.C.	Last Date of Sale	Est. No. Employees	Tax Rate per $1,000	Land Values
Auto Repair Shop Spring Street, Plympton	Paul Harper Owner	Auto Repair	7,538	1970		$20.70 *	12,260
Noonan-Leyden Press Samoset Street, Plymouth	TVN Realty Trust, Owner	Printing	2,754	1981	45	$24.20 *	403,000
American Oil Company 111 Samoset Street, Plymouth	American Oil Baltimore, MD	Gas Station	5,541	1971	10	$24.20	114,660
Dog Kennel Nathaniel Street, Plymouth	Evelyn Wall	Kennel	N.A.	N.A.	0	$24.20	28,850
Blue Cross/Blue Shield Microwave Tower Richards Road Plymouth	same	Offices	N.A.	N.A.	NA	$24.20	100,000
Ceeco Corp. Richards Road Plymouth	same	Indus-trial Supplies	NA	NA	NA	$24.20	163,000

* Tax Rates for Fiscal Year 1986
NA = Not Available

FIGURE 4-4-6

SAMPLE REAL ESTATE LISTINGS

Week	Total SF Units	# of B'Rooms 1	2	3	4	5	Not Spe	25-50	Price 50-75	75-100	100-150	150+	Not Spec'd	Apart-ments
June 28, 1984	10		1	5	1		3	1	4	1	3	1		
May 24, 1984	15		1	4	3		7	2	1	8	3	1		
April 26, 1984	27		3	6	2	1	15	1	5	11	8	1	1	
March 29, 1984	18		1	6	6		5	1	6	5	5	1		10
Feb. 23, 1984	16			7	4		5	1	5	6	4			
January 26, 1984	13		1	6	2		4	1	6	4		1	1	11

FIGURE 4-4-7

COMPARISON OF AFFECTED HOUSES WITH HOUSES FOR SALE

Number of	Affected Houses					Houses for Sale*					Not
Bedrooms	25-50	50-75	75-100	100-150	150+	25-50	50-75	75-100	100-150	150+	Spec'd
1						1	1				
2	2	1				1	6	1			
3	3	1				3	17	10	6		1
4	2							8	6	1	1
5+			1				1		1		
Unspecified	4					3	2	16	11	4	1
Total	11	2	1			8	29	35	24	5	3

* Sample of Houses for Sale, Old Colony Memorial, January - June 1984

NOTE: FIGURES 4-4-6 and 4-4-7 were current as of the end of June, 1984. Since that time, 8 houses (price range about $100,000-$130,000) were constructed within the proposed right of way on Spring Street in Carver, as shown in FIGURE 4-4-4. FIGURE 4-4-7 indicates that had it been necessary to relocate these 8 families in 1984, there would have been a more than adequate number of houses on the market to meet that demand. As FIGURE 4-4-8 shows, the number of houses constructed in Carver doubled from 1983 to 1984 and almost doubled again from 1984 to 1985, indicating that the supply in Carver alone was much greater than necessary to meet the increased relocation demand.

FIGURE 4-4-8

BUILDING PERMITS ISSUED FOR NEW CONSTRUCTION

	Carver	Plymouth
1979	62	431
1980	48	418
1981	39	547
1982	52	435
1983	42	617
1984	87	352
1985	134	422

5. VISUAL QUALITY

The very introduction of a road where none existed before will alter the visual aspects of the landscape through which it passes. From the point of view of those looking at the road from the outside, the change will be apparent only where the road is located adjacent to developed areas. Even there, good design requires that as much of the existing vegetation as possible be retained or restored.

The driver's view of the road also deserves particular attention, not only to make a journey less monotonous and therefore safer, but also to provide the infrequent visitor as well as the commuter with a visually attractive and instructive experience.

A highway's appearance is governed by applicable construction standards regarding pavement, land markings, guard rails, signs and required slopes and setbacks. The principal variables are: the topography and the potential for vistas and panoramic views; the character of the existing landscape; how it is changed by the construction and the consequent need for beautification; the design of bridges; landscaping; and the location of the pavement within the right of way.

For over 2/3 of its length (5 of its 7.48 miles), the preferred Alternative 4-M-5 will traverse areas which are owned either by institutions or governments and will therefore remain pristine, forested, and undeveloped. The other 1/3 of 4-M-5 will traverse relatively open areas, principally cranberry bogs and wetlands. The right of way will approach homes in a very few locations and even then the pavement will be at least 200' distant, for as the typical cross section shows, there will generally be about 135' of open area on either side of the travelled way. Due to these circumstances, there will be no adverse visual impacts from 4-M-5.

6. HISTORIC AND ARCHAEOLOGICAL RESOURCES

No historic sites will be affected by the preferred Alternative 4-M-5. See FIGURE 4-6-1.

There are prehistoric archaeological sites within the right of way of 4-M-5 that were determined by the Federal Highway Administration (FHWA), the Massachusetts Department of Public Works (MDPW), and the Massachusetts Historical Commission (MHC) to be potentially eligible for nomination to the National Register of Historic Places as significant contributing elements of the Annasnappet Archaeological District. See letters from FHWA and MHC, dated respectively September 11, 1984 and October 24, 1984, FIGURES 4-6-2 and 4-6-3.

A Memorandum of Agreement has been ratified between the FHWA, MDPW, Massachusetts SHPO and the Advisory Council on Historic Preservation, stating that avoidance and preservation in place are not feasible alternatives and that full scale data recovery will be undertaken as the means of mitigating the adverse effects of the project upon the District. The archaeological data recovery program will be implemented in accordance with the stipulations outlined in the Memorandum (FIGURE 4-6-4).

ʼ 63

MASSACHUSETTS HISTORICAL COMMISSION

COMMONWEALTH OF MASSACHUSETTS
Office of the Secretary of State

294 Washington Street
Boston, Massachusetts
02108
617-727-8470

MICHAEL JOSEPH CONNOLLY
Secretary of State

September 23, 1980

Mr. Justin Radlo, Chief Engineer
Massachusetts Department of Public Works
100 Nashua Street
Boston, MA 02114

Re: Route 44, Plymouth

Dear Mr. Radlo:

MHC staff have reviewed the information supplied by Elizabeth R. Amadon regarding historic buildings and structures impacted by Route 44. MHC feels that this project is unlikely to affect significant historic architectural resources. No further review in compliance with Section 106 of the National Historic Preservation Act of 1966 is required for building; archaeological review is still pending.

If you have any further questions, please feel free to call Valerie Talmage, State Archaeologist.

Sincerely,

Valerie Talmage

for Patricia L. Weslowski
State Historic Preservation Officer
Executive Director
Massachusetts Historical Commission

PLW/pmb

CHIEF ENGINEER
RECEIVED
SEP 29 1980

FIGURE 4-6-

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION ONE
55 Broadway - 10th Floor
Cambridge, MA 02142

IN REPLY REFER TO:
HPE-MA

Route 44, Kingston, Carver and Plymouth

September 11, 1984

RECEIVED
SEP 17 1984
MASS. HIST. COMM.

Ms. Patricia Weslowski, State
Historic Preservation Officer
Massachusetts Historical Commission
294 Washington Street
Boston, Massachusetts 02108

Dear Ms. Weslowski:

The Federal Highway Administration (FHWA) in accordance with 23 CFR 800.4(d) has determined that the proposed Route 44 project through Kingston, Carver and Plymouth will have an adverse effect upon four prehistoric sites determined to be potentially eligible for nomination to the National Register of Historic Places. The attached archaeological reports (Attachment 2) describing the results of an intensive survey and site examination serve as the basis for determining the potential eligibility for nomination to the National Register of a site identified as locus 8. The sites identified as loci 1 and 2 were previously determined by the Department of Public Works, FHWA and SHPO to be significant and potentially eligible for nomination to the National Register. The significance of locus 9 will be determined upon retrieval of data during recovery operations of loci 1, 2, and 8. The full scale data recovery program will be in accordance with procedures outlined in the attached research design (Attachment 6) and is proposed to serve as the mitigation in accordance with 36 CFR Part 800.4(d). We have attached a preliminary case report for your review and request your concurrence in the "adverse effect" determination. If further information is required please call Aida Berkovitz at 494-2255.

Sincerely yours,

James A. Walsh
Division Administrator

By: P. Robinson
P. Robinson
Transportation Planner

Attachments

cc: Mr. J. Eliot, DPW

FIGURE 4-6-2

<u>Preliminary Case Report</u>

The following information is submitted in accordance with Section 800.13(of 36 CFR 800.

1. From Title 23, United States Code, "Highways", the Federal Highway Administration (FHWA) is authorized to expend funds appropriated fro the Highway Trust Fund for construction of Federal-aid highways. Applicable implementing regulations, procedures, and guidelines are contained in the Federal-aid Program Manual, Volumes 1 through 7.

2. FHWA has aprpoved a Draft Environmental Impact Statement and is awaiting completion of the Final Environmental Impact Statement. FH must still authorize the design of the project, authorize acquistion right-of-way, and approve the plans, specifications and estimate bef authorizing construction.

3. The Draft Environmental Impact Statement was approved by FHWA on Apr 23, 1979. The target date for completion of all environmental respo sibilities is October 1985.

4. The proposed project entails the improvement of U.S. Route 44 betwee Route 58 in Carver and Route 3 in Plymouth, a distance of about 7 miles. The selected alternate is on new location and will be a 4-la controlled access highway with 4-interchanges. Attachment 1 is a pr liminary plan showing the relocation of Route 44 in relation to the historic sites.

5. There are four prehistoric sites affected by the project that appear be eligible for the National Register. They are identified as loci 2, 8 and 9. Detailed descriptions of these archaeological sites are included in the attached Phase I and Phase II reports (Attachment 2)

6. The criterion listed under 36 CFR 800.3(b)(1) applies. These sites will be destroyed or altered by the proposed horizontal and vertical alignment of the new project.

7. A letter from the Massachusetts Department of Public Works dated Aug 9, 1984 is attached (Attachment 3).

8. A letter from the SHPO dated October 24, 1984 is attached (Attachmen 4)

9. Attachment 5 shows the various alternatives studied in the Draft Environmental Impact Statement. The No Build and Upgrade Existing alternatives do not affect the prehistoric sites in the Annasnappet Archaeological District.

The No Build alternative does not resolve the traffic safety problems associated with existing roadway and the Upgrade Existing alternative would have severe impacts on the residential neighborhoods in Plymouth, thus requiring excessive relocations. A partial relocation of Route 44 in the form of alternatives 3-W and 3-E would not affect the prehistoric sites, but again, this alternative does not resolve the traffic and safety problems through Plymouth on the existing roadway. In addition, this alternative would affect another historic site with potential National Register eligibility. Any other southern alternatives that would avoid the Annasnappet Archaeological District would require massive right of way takings because of the large residential area in Plymouth. Any alternative to avoid the Annasnappet Archaeological District by swinging north of the area would impact wetlands and would not be geometrically feasible.

The selected alternative (4-M-5) and alternative 4-N, 4-M-1, 4-M and 4-L all affect the Annasnappet Archaeological District. The selected alternate was chosen to avoid 4(f) lands, an area with a rare endangered species, wetlands, and a historic area. It was also chosen because of its ability to alleviate traffic congestion at Spring Street and to make contact with the Plymouth Industrial Park.

10. The adverse effect of the archaeological sites will be mitigated by a data recovery program. The data recovery program will be consistent witht he procedures outlined inthe attached research design (Attachement 6) and Memorandum of Agreement between FHWA, MDPW, Massachusetts SHPO and Advisory Council.

11. Cost Estimate:

	Construction
Total	$42,373,000
Federal Funds	$31,779,750

The Commonwealth of Massachusetts

Office of the Secretary of State
Michael Joseph Connolly, Secretary

Massachusetts Historical Commission
Valerie A. Talmage
Executive Director
State Historic Preservation Officer

October 24, 1984

James A. Walsh
Division Administrator
Federal Highway Administration
55 Broadway, 10th Floor
Cambridge, MA 02142

ATTN: Aida Berkowitz

RE: Route 44 - Kingston, Carver and Plymouth

Dear Mr. Walsh:

Thank you for submitting the archaeological reports and project materials regarding the proposed Route 44 project through Kingston, Carver and Plymouth. My staff and I have reviewed these materials.

The selected alternative for the Route 44 project will have an adverse effect (36CFR 800.3(b)(1)) on the Annasnappet Archaeological District in Carver, a property which is considered to be eligible for inclusion in the National Register.

The Annasnappet District includes several important prehistoric archaeological site loci within a geographically defined area encompassing the headwaters of the Annasnappet River, presently used for the cultivation of cranberry bogs. The boundaries of the district are defined topographically to include the well-drained sandy ridges which flank the bogs and possess evidence of prehistoric land use. The prehistoric sites which are contributing elements of the district are loci 1,2,7,8, possibly 9 and 10 (see enclosed map, which identifies the loci by number; these numbers should be added to your Attachment 1 for clarity of discussion). Site loci 5 and 6 are non-contributing to the district.

FIGURE 4-6-3

50 Boylston Street, Boston, Massachusetts 02116 (617) 727-8470

The remainder of the ridges included within the district boundaries have not been formally surveyed; however, by analogy to the site loci within the surveyed areas, the nonsurveyed ridge tops possess topographic and environmental attributes analogous to the settings of the known sites within the district. Thus, it is highly probably significant archaeological remains associated with the prehistoric exploitation of the Annasnappet headwaters are present within the remainder of the district's elevated areas.

The Annasnappet District possesses sufficient integrity and significance to be eligible for listing in the National Register. The significance of the district lies with its archaeological data, which are important for addressing compelling research questions concerning the prehistoric settlement and subsistence systems of the interior region of the Massachusetts coastal lowland, particularly during the Middle Archaic period. Thus, the district meets criterion D of the National Register.

Project design plans indicate that the proposed highway construction will have an adverse effect on prehistoric site loci 1,2,5,6,8, and 9 through destruction of these archaeological sites (36CFR 800.3(b)(1)). The adverse effects of the project on site loci 1,2,8, and 9 should be mitigated through an archaeological data recovery program. Included within the scope of the data recovery program should be a site examination of locus 9 to determine if the site is indeed a contributing element of the district, as well as a survey of the proposed outfall drain line, which traverses as previously unsurveyed portion of the district.

Additional possible project impacts to the district which have not yet been determined include the probable removal of gravel, the construction of replacement cranberry bogs, and/or construction staging use of areas outside the proposed right-of-way but within the archaeological district. MHC requests the opportunity to review any such proposals in order to evaluate their effects on the district and to determine the need for additional archaeological investigation or data recovery within the district.

If you have any questions concerning these comments, please feel free to contact Brona Simon, State Archaeologist, or me.

Sincerely,

Valerie A. Talmage
State Historic Preservation Officer
Executive Director
Massachusetts Historical Commission

VAT/hi
Enclosure
cc: Ron Anzalone, Advisory Council on Historic Preservation
Robert McDonagh, Mass. Dept. of Public Works
Jim Elliot, Mass. Dept. of Public Works

Advisory Council On Historic Preservation

The Old Post Office Building
1100 Pennsylvania Avenue, NW, #809
Washington, DC 20004

SEP 20 1985

Mr. James A. Walsh
Division Administrator
Federal Highway Administration
55 Broadway - 10th Floor
Cambridge, MA 02142

REF: U.S. 44 Improvements
Kingston, Carver, and Plymouth, Massachusetts

Dear Mr. Walsh:

The enclosed Memorandum of Agreement for the referenced project has been ratified by the Chairman of the Council. This document constitutes the comments of the Council required by Section 106 of the National Historic Preservation Act and the Council's regulations. A copy of the ratified Agreement has also been sent to the Massachusetts State Historic Preservation Officer.

The Council appreciates your cooperation in reaching a satisfactory resolution of this matter.

Sincerely,

Michael C. Quinn

for Don L. Klima
Chief, Eastern Division
of Project Review

Enclosure

FIGURE 4-6-4

MEMORANDUM OF AGREEMENT

WHEREAS, THE Federal Highway Administration (FHWA) has determined that the selected alternative (4M5) for the Route 44 relocation project in Kingston-Plympton-Carver-Plymouth will have an adverse effect upon the Annasnappet Archaeological District and has requested comments of the Advisory Council on Historic Preservation (Council) pursuant to Section 106 of the National Historic Preservation Act (16 U.S.C. 470 f) and its implementing regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800).

WHEREAS, Phase I (intensive survey) and Phase II (site examination) archaeological surveys were conducted within the proposed right-of-way and several site loci -1,2,8 and 9 - were determined by FHWA, the Massachusetts Department of Public Works (MDPW) and the Massachusetts State Historic Preservation Officer (SHPO) to be potentially eligible for listing in the National Register as significant contributing elements of the Annasnappet Archaeological District.

NOW, THEREFORE, FHWA, the Massachusetts SHPO and the Council agree that avoidance and preservation in place are not feasible alternatives and that mitigation shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on archaeological properties.

STIPULATIONS

1. Full Scale Archaeological Data Recovery

   A. Properties identified within the Annasnappet Archaeological District

   FHWA shall ensure that a Phase III archaeological data recovery program will be conducted on site loci 1,2,8 and 9 as the means of mitigating the adverse effects of this project on a portion of the Annasnappet Archaeological District. Included within the scope of the data recovery program will be a site examination of locus 9 for the purpose of evaluating the site's significance as a contributing component of the District. This program for data recovery, including the research design, scope of work and work plan, will be reviewed by MDPW, FHWA and the Massachusetts SHPO for approval prior to implementation.

   Auxiliary project impacts such as drainage and the staging of construction equipment will be confined to the proposed right-of-way and previously surveyed areas. The design profile of the project is such that borrow material will not be required from outside sources. Once areas for wetland replacement have been identified, archaeological investigations will be conducted within the unsurveyed portions of these areas prior to construction. The nature and scope of these archeological surveys will be determined by FHWA, MDPW and the Massachusetts SHPO.

B. Research Goals and Scope of Work

Allowing for minor refinements, the research goals, approaches methods and laboratory analysis will follow the guidelines presented in the research design (see attachment) prepared by Harvard University's Peabody Museum.

C. Written Report

After completion of the fieldwork and analysis, a full report will be prepared, describing the goals, methods and results of the study consistent with descriptive and analytical practices common to the discipline. Copies of the report will be provided to MDPW, FHWA and the Massachusetts SHPO.

2. Performance Standards

A. The archaeological investigation will be conducted by qualified individuals who meet, at a minimum, the appropriate qualifications in "Professional Qualifications" contained in the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation and in a manner consistent with those Standards and Guidelines and the Council's Handbook, Treatment of Archaeological Properties.

B. The Massachusetts SHPO shall review within 30 days of receipt any documents submitted by FHWA in accordance with any of the stipulations written above. Failure by the Massachusetts SHPO to respond within 30 days of receipt of any complete documents from FHWA shall be deemed to constitute full approval of such documents under the stipulations written above. If the Massachusetts SHPO and FHWA fail to agree, then the agency shall submit documentation to the Council and request consultation under 36 CFR 800.6.

Execution of this Memorandum of Agreement has afforded the Council a reasonable opportunity to comment on the Route 44 relocation project, Kingston-Plympton-Carver-Plymouth and its effects on archaeological properties and the FHWA has taken into account the effects of this undertaking on archaeological properties.

(date) 7/15/85

Federal Highway Administration

(date) 7/17/85

Massachusetts State Historic
Preservation Officer

William A. Billings (date) 7/11/85

Chief Engineer
Massachusetts Department of Public Works

Sept 5, 1985
(date)

Excutive Director
Advisory Council on Historic Preservation

(date) 13 Sept. '85

Chairman
Advisory Council on Historic Preservation

RECEIVED
AUG 27 1985
ADVISORY COUNCIL ON HISTORIC PRESERVATION

7. FARMLANDS

Construction of any roadway will convert some land away from its original use; in particular, the conversion of farmland is becoming a major concern. In response the federal government put forth the Farmland Protection Policy Act (FPPA), 7 U.S.C. 4201 et seq and the regulations promulgated thereunder in 7 CFR Part 658. This act considers farmland to be both land currently being used for agriculture and soil types suitable for farming (not necessarily in agricultural use). The U.S. Soil Conservation Service (SCS) has classified and mapped out these soil types (See MAP 4-F).

The Washington office of the SCS and the MDPW underwent extensive consultation regarding the FPPA so that proper steps toward compliance could be taken for the Route 44 project. These steps included, but were not limited to, meetings and discussions with: the local office of the SCS, a representative from the Federal Highway Administration, the Massachusetts Department of Food and Agriculture, and local assessors from Carver, Plympton, Kingston, and Plymouth.

The U.S. Department of Agriculture recommends that sites receiving a total score of less than 160 (see Figure 4-7-1) be given a minimal level of consideration for protection and, no additional sites be evaluated. therefore, this site (corridor 4-M-5) has been found to be of relative minimal value due to its receiving only 152 total points, thus falling below the 160 point threshold for minimal consideration.

Cranberry bogs are considered prime and unique agricultural lands. The preferred Alternative 4-M-5 will require the acquisition of portions of two cranberry bogs, both in the town of Carver: 3.86 acres from one bog, and 1.30 from the other, a total of 5.16 acres. It appears that by far the greatest part of the existing bogs will remain unaffected by the road, and that they can continue to operate with a slightly reduced size.

The 5.16 acres within the right of way are the minimum acquisition and are based on a median width of 60', instead of the 100' customarily used. It was not possible to avoid them altogether, because bogs in this part of Carver, east of Route 58 and north of High Street, are very numerous and widespread. Furthermore, the more southerly the alignment, the greater the impact on residential development and on a historical site at Cole's Mill.

It is intended to retain as wetlands those portions of the existing bogs which lie within the right of way, and are not affected by the roadbed. It is not possible, however, to continue the use of those portions as cranberry bogs, because of the legal issues involved in maintenance and liability. The Department will compensate the owners of the bogs for their at fair market value. It will then be the option of the owners to create new bogs or not.

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request NOV. 30, 1984
Name Of Project ROUTE 44 Relocation	Federal Agency Involved Federal Highway Administration
Proposed Land Use Highway	County And State Plymouth Co., MA
PART II *(To be completed by SCS)*	Date Request Received By SCS 12-21-84

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply — do not complete additional parts of this form).*	Yes ☒ No ☐	Acres Irrigated 61	Average Farm Size 25
Major Crop(s) CRANberry	Farmable Land In Govt. Jurisdiction Acres: 87830 % 20%	Amount Of Farmland As Defined In FPPA Acres: 123700 % 29%	
Name Of Land Evaluation System Used LESA	Name Of Local Site Assessment System —	Date Land Evaluation Returned By SCS 1-17-85	

	Maximum Points	Site A	Site B	Site C	Site D
PART III *(To be completed by Federal Agency)* — Alternative Site Rating					
A. Total Acres To Be Converted Directly		425			
B. Total Acres To Be Converted Indirectly		180			
C. Total Acres In Site		605			
PART IV *(To be completed by SCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland		61			
B. Total Acres Statewide And Local Important Farmland		70			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted		.1%			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value		.1%			
PART V *(To be completed by SCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*		81			
PART VI *(To be completed by Federal Agency)* Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b))*	Maximum Points				
1. Area In Nonurban Use	15	12			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	0			
4. Protection Provided By State And Local Government	20	7			
OMIT 5. ~~Distance From Urban Builtup Area~~ Corridor Devel.	—				
OMIT 6. ~~Distance To Urban Support Services~~	—				
7. Size Of Present Farm Unit Compared To Average	10	10			
8. Creation Of Nonfarmable Farmland	25	7			
9. Availability Of Farm Support Services	5	5			
10. On-Farm Investments	20	20			
11. Effects Of Conversion On Farm Support Services	25	0			
12. Compatibility With Existing Agricultural Use	10	0			
TOTAL SITE ASSESSMENT POINTS	160	71			
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	81			
Total Site Assessment *(From Part VI above or a local site assessment)*	160	71			
TOTAL POINTS *(Total of above 2 lines)*	260	152			

Site Selected: Site A	Date Of Selection July 1982	Was A Local Site Assessment Used? Yes ☐ No ☒

Reason For Selection The process of site selection began approximately July 1979. Whereupon many factors and comments were considered. Alignment 4M-5 (site A) was found to best serve all the involved interests. Refer to Project FEIS for details.

FIGURE 4-7-1

(See Instructions on reverse side)

Form AD-1006 (10-83)

8. LAND USE AND ECONOMIC DEVELOPMENT

The preferred Alternative 4-M-5 is likely to intensify the rate of development of industrially zoned land in Plymouth, Plympton and Kingston, a consequence which has been a prime objective of the project from its inception. However, such development in Plympton and Kingston is dependent on additional local actions, as described below.

Relocated Route 44 will pass through the Plymouth Industrial Park and an interchange will be located within it, as shown on MAP 4-D, which also shows industrially zoned areas in Kingston and Plympton. 4-M-5 will not serve that area in Kingston as directly as it does the Park in Plymouth, but a connection is possible from Cherry Street/Nicks Rock Road which would enable direct service. There is a similar situation with respect to the industrial area in Plympton. 4-M-5 will pass through a portion of it, thus providing highway visibility for future industrial buildings. However, the undeveloped portion of this industrial area, closer to the Kingston town line, will require access roads to be built off Spring Street, where there will be an interchange. The Spring Street interchange will also provide service to the existing Halliday Lithograph Co. plant which is located on Spring Street a short distance from the interchange.

Since nearly all of the 4-M-5 corridor in Kingston goes through land which is institutionally or publicly owned, its development is unlikely. The relatively small area which is privately owned is remote and inaccessible, and there is no reason that 4-M-5 should stimulate development. Nor can any changes of land use be expected in Carver due to a relocated Route 44. The land through which it will pass is committed to wetlands, cranberry bogs and existing houses, or to residentially zoned areas in which development has been occurring during the past few years.

The 4-M-5 corridor has, in effect, been adapted to conform to existing land use and zoning patterns. Consequently, no changes in land use or zoning are anticipated. No community facilities are affected.

The region's dramatic residential growth in recent years is attributable in part to the discovery of its natural environmental qualities in the expansion of the Boston metropolitan area. Although some growth was therefore to have been expected, it is not likely to have attained its current pace had it not been for the existence of Route 3. An improved Route 44, as the final link in the I-495 circumferential corridor, will provide the region with the east-west connection it now lacks and can therefore be expected to provide it with the same kind of economic stimulus as Route 3 has done. A foreseeable and desirable impact of the resulting residential and industrial growth will be a shortening of the journey to work for those employed in local industries.

It is not likely that tourism will increase if Route 44 is relocated, because Plymouth's historical attractions are sufficiently magnetic despite traffic and parking congestion.

9. BIKEWAYS

The 400' right of way of Alternative 4-M-5 is sufficient to allow construction of a separated bike path without affecting the layout of the travelled ways, the median, or the side slopes associated with the highway portion of the corridor. The recreational use of the corridor is a desirable concept and is recommended in new highway development when feasible. This type of bikeway is a Class I facility called a Bike Path -- that is, one which shares a right of way with another transportation use.

A Boston to Cape Cod Bike Route was established about six years ago. It is considered a Class III facility, because it makes use of existing streets and highways, which ideally are those carrying low volumes of traffic and with low accident rates. Within the general area of Route 44 and Alternative 4-M-5, this Bike Route utilizes Route 58 in Plympton and then follows local streets including Brook Street. After crossing into Kingston, it follows Route 80 to Route 44 for a short distance and then proceeds to the center of Plymouth via Summer Street.

The Draft EIS gave serious consideration to the possibility of using relocated Route 44 as a Bike Path. Theoretically, at least, such a Path was indeed possible. It would have followed accepted standards for Bike Paths with respect to slope gradient, curvature and lane width. Crossings at intersecting streets and interchanges would have been at grade. Its purposes would have been recreational, and as a possible attraction to nearby commuters.

Despite the attractiveness of the concept, however, the feasibility of a Bike Path in the 4-M-5 corridor is questionable, due to the number and extent of the wetlands involved. As has been documented in earlier sections, great care has been taken to minimize the impact of the highway on existing wetlands, principally by reducing the width of the median and by retaining as much of the wetlands and natural areas within the right of way as possible.

The addition of a Bike Path would necessitate the widening of enhancements and increase filled areas, resulting in greater losses of wetlands. In view of this, and since there already is a Bike Route serving the area, it is not prudent to propose a Bike Path within the right of way of a relocated Route 44.

10. ENERGY

There is no formal statewide or regional transportation energy plan in Massachusetts. However, it has been a major objective of the transportation agencies in Massachusetts to reduce the growth of private automobile commuting in the Metropolitan Boston area by providing efficient and adequate alternative transportation services.

The Massachusetts Bay Transportation Authority (MBTA), through its consultants the Sverdrup Corporation, is presently preparing a study seeking to maximize use of its rights of way which were once part of the system of the Old Colony Railroad, a branch of the former New York, New Haven and Hartford Railroad. Specifically, the study involves the possible extension of commuter rail service to Plymouth and other communities south of Boston from the MBTA's Red Line terminus at Braintree. The study will have the form of an Environmental Impact Report pursuant to Massachusetts law, since there are no Federal funds involved at this time; there is an understanding however, that it will be equivalent to a Draft Environmental Impact Statement pursuant to Federal regulations.

The study includes analysis of commuter parking lots at several likely stops of the proposed rail service: at the former Cordage plant in Plymouth; at the so-called Winery location just north of Plymouth's central historic area; and at the junction of Routes 3 and 3A in Kingston. The Report is to be completed in mid-1987, and the proposed schedule calls for operations to commence in 1990.

At the present time bus service to Boston from Plymouth and other communities is provided by the Plymouth & Brockton Street Railway Company. It maintains a commuter parking lot in the Plymouth Industrial Park at the interchange of Cherry Street and Route 3, which will be served directly by the proposed Alternative 4-M-5.

The Commonwealth is actively seeking and developing satellite parking facilities in the region and is encouraging use of its transit system and commuter rail facilities. These measures are directed towards reducing the region's consumption of energy and improving air quality while maintaining a healthy economic environment. The region's roadway network is a significant factor in the economic environment.

All build alternatives for Route 44 will require similar energy consumption for construction and operation. The energy operation consumption of Alternative 4-M-5 is lower than that which would be required to operate the existing network under the No-Build Alternative. This is due to two reasons. First, Alternative 4-M-5 is approximately 7.48 miles long while existing Route 44 is about 8.03 miles long. Also, the proposed Alternative 4-M-5 will be a new limited access highway providing a high quality traffic flow at Level of Service A. By contrast, projected traffic volumes show that under the No-Build Alternative, traffic flow on Route 44 in Plymouth will become intolerable during peak periods by the year 2000. Vehicles will be travelling at slower speeds with many stops required at intersections.

11. OTHER IMPACTS: UNAVOIDABLE PROBABLE IMPACTS; SHORT TERM USES VS. LONG TERM PRODUCTIVITY; IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES.

The relocation of Route 44 will result in short term costs and benefits as well as long term costs and benefits. An evaluation of their relative values, nearly all of which are unquantifiable, is a matter of judgment.

The short term costs will be the temporary disruption of the environment through which the preferred Alternative 4-M-5 will pass, and the dislocation of families and businesses, both of which effects are highly localized. There is also the expenditure of funds which will come from the state and federal governments. The short term benefits derive principally from the expenditure of those funds, resulting in increased employment and therefore increased purchasing power, and the purchase of materials.

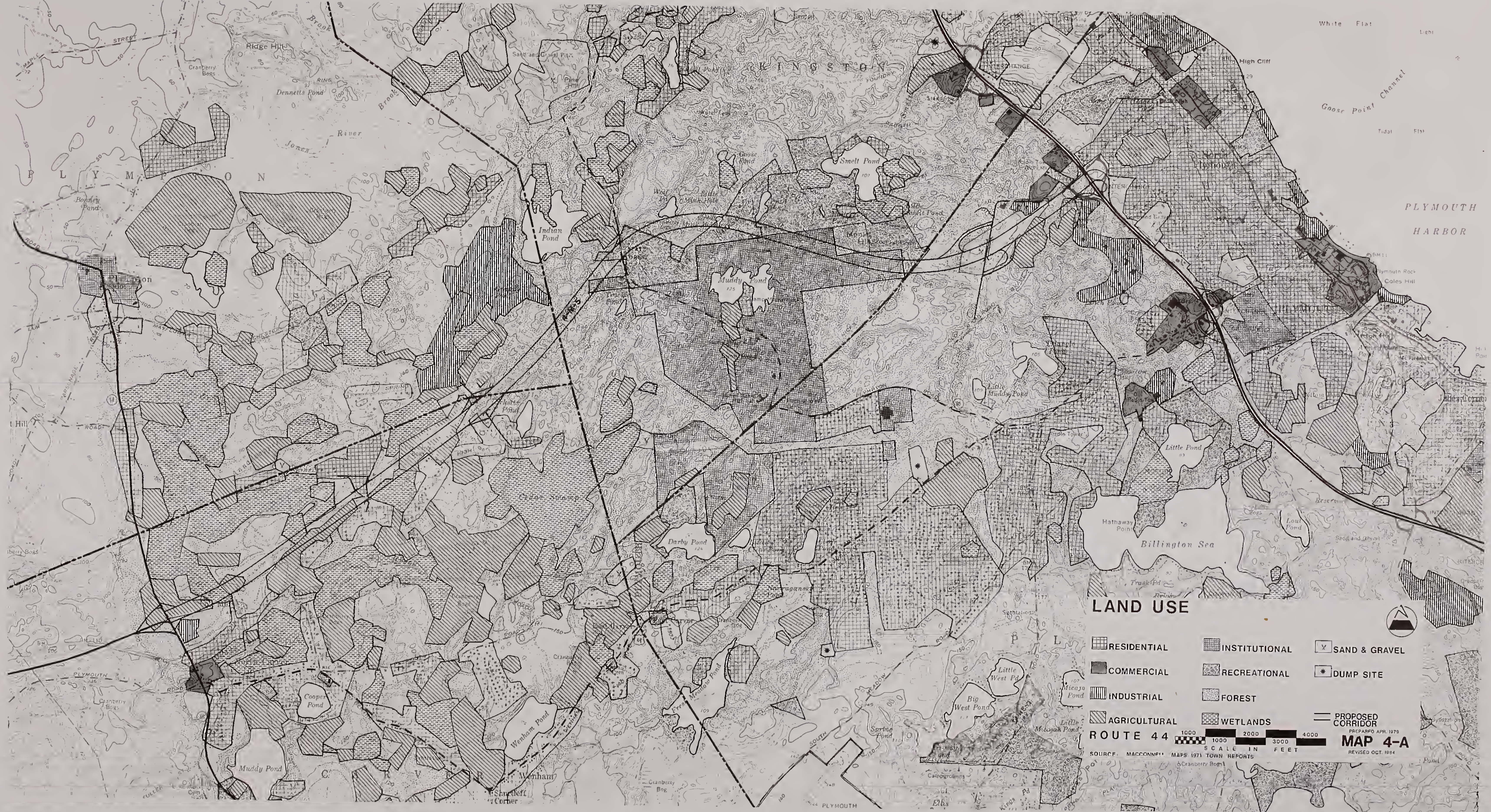
The long term benefits will be greater industrial growth and local employment bolstering the economic base of individual towns and the region. Other benefits will be: improved safety; relief from traffic congestion both on existing Route 44 as well as in adjoining neighborhoods; and savings in travel time. These advantages will be enjoyed not only by residents of the area but also by tourists to Plymouth and Cape Cod, and will therefore benefit the region's productivity.

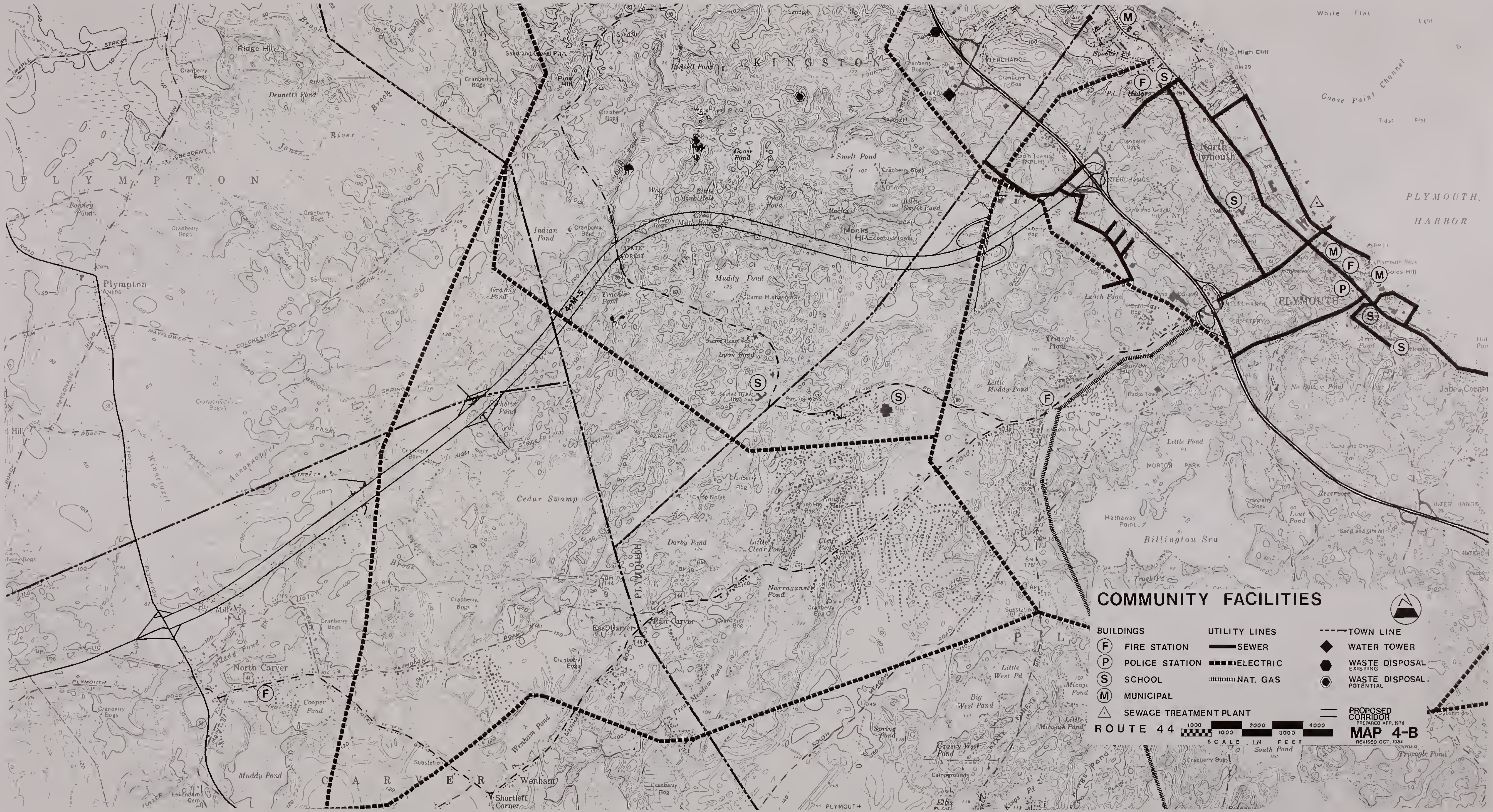
The long term costs include the introduction of air pollution and additional noise into a new environment, although these same effects will be reduced and eliminated by appropriate mitigative measures. As a benefit, their transfer to another environment will result in a reduction of the same effects on existing Route 44. There will also be an unavoidable and long term loss because of the removal of cranberry bogs. Although the alteration of wetlands represents an unavoidable and long term commitment, appropriate mitigative measures, including their replacement, will assure the long term maintenance of their ecology once construction has been completed.

A new highway is a permanent addition to the landscape and consequently its maintenance is a permanent commitment. It may be theoretically possible to remove a highway but that likelihood is similarly theoretical. The length of the preferred Alternative 4-M-5 is 7.48 miles which, at a right of way width of 400 feet, means that approximately 363 acres of land will be committed, not including ramps or other improvements outside the main corridor.

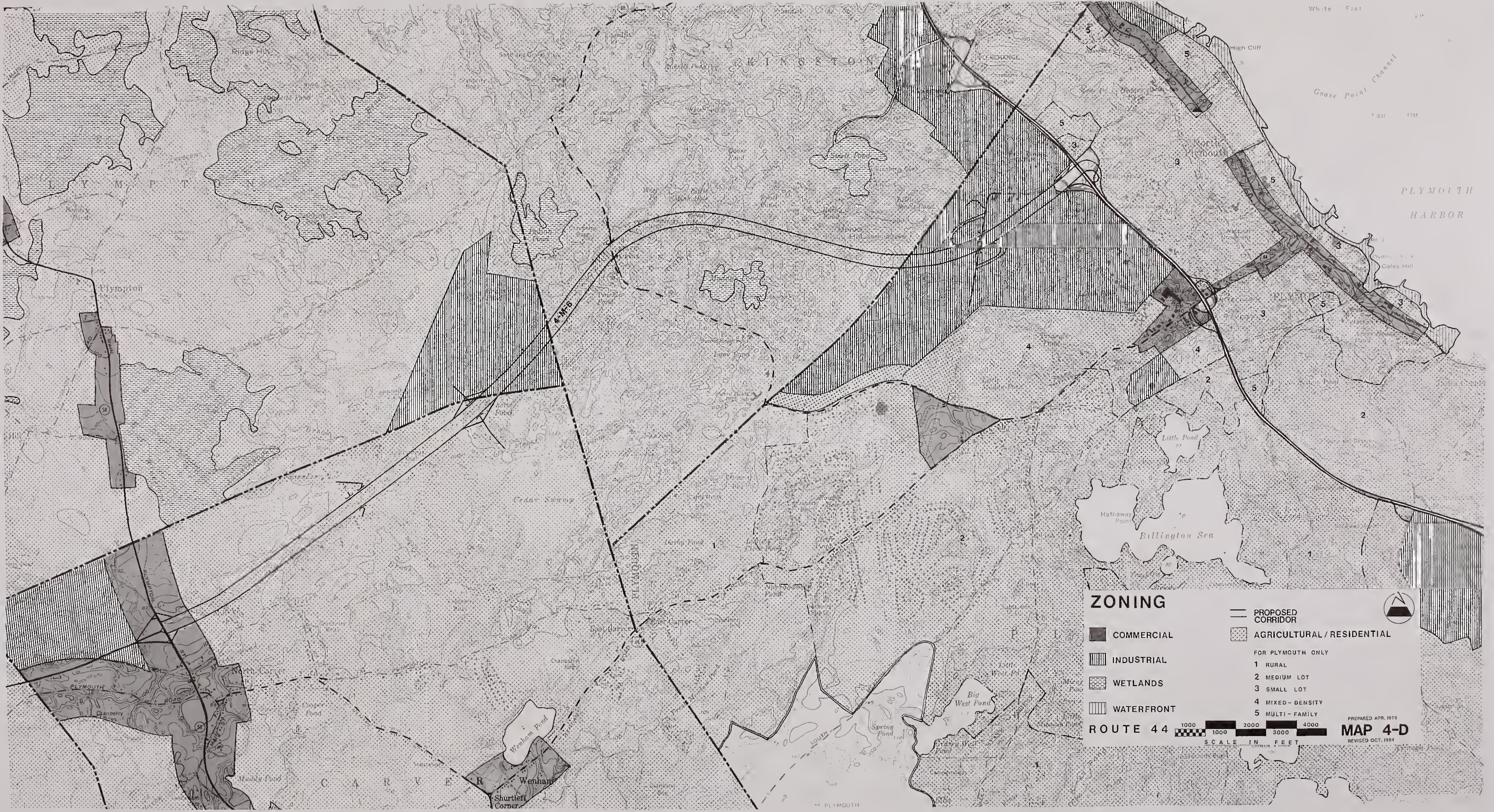
Within that total, 28.67 acres of wetlands will be affected, as shown in FIGURE 4-1-7. However, it is proposed to create 29.6 acres of new wetlands as a mitigating measure, through the conversion of uplands outside the 4-M-5 corridor. It will also traverse the Annasnappet Archaeological District, but full data recovery has been committed.

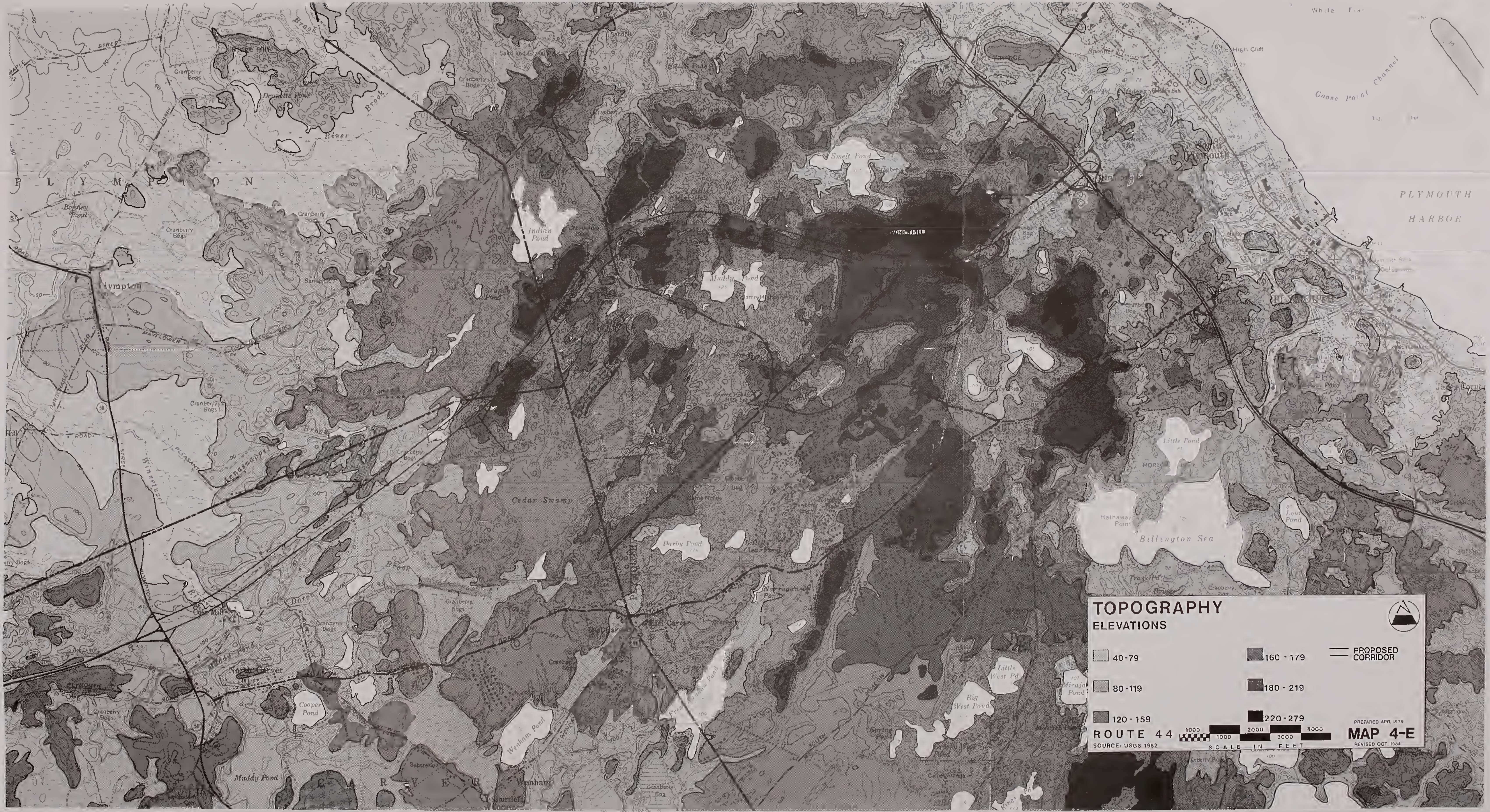
Apart from these readily identifiable changes, a new highway will have other consequences which are not as easily predictable. Alternative 4-M-5 will accelerate the development of industrial land because of the accessibility and visibility it will provide. Other effects producing irreversible commitments of resources are those relating to the materials required for construction, and the secondary growth of population and land use changes caused by a bolstered local economy.


LAND USE
RESIDENTIAL
COMMERCIAL
INDUSTRIAL
AGRICULTURAL
INSTITUTIONAL
RECREATIONAL
FOREST
WETLANDS
SAND & GRAVEL
DUMP SITE
PROPOSED CORRIDOR
ROUTE 44
1000 2000 4000
1000 3000
SCALE IN FEET
SOURCE: MACCONNELL MAPS 1971 TOWN REPORTS
PREPARED APR. 1979
MAP 4-A
REVISED OCT. 1984
KINGSTON
PLYMPTON
PLYMOUTH HARBOR
Billington Sea
Indian Pond
Muddy Pond
Smelt Pond
Little Pond
Darby Pond
Cooper Pond
Wenham Pond
Big West Pond
Little West Pd
Cedar Swamp
Ridge Hill
Dennetts Pond
Goose Point Channel
Cranberry Bogs


COMMUNITY FACILITIES
BUILDINGS
F FIRE STATION
P POLICE STATION
S SCHOOL
M MUNICIPAL
SEWAGE TREATMENT PLANT
UTILITY LINES
SEWER
ELECTRIC
NAT. GAS
TOWN LINE
WATER TOWER
WASTE DISPOSAL EXISTING
WASTE DISPOSAL POTENTIAL
PROPOSED CORRIDOR
PREPARED APR. 1979
REVISED OCT. 1984
ROUTE 44
SCALE IN FEET
1000 0 1000 2000 3000 4000
MAP 4-B
PLYMPTON
KINGSTON
CARVER
PLYMOUTH
PLYMOUTH HARBOR
North Plymouth
Plymouth
North Carver
East Carver
Billington Sea
Cedar Swamp
Muddy Pond
Smelt Pond
Indian Pond
Darby Pond
Little Pond
Goose Point Channel
Shurtleff Corner
Wenham
Ridge Hill
Jones River
Annasnappet Brook
Winnetuxet

LAND AND CULTURAL RESOURCES
PUBLIC
HISTORIC
POTENTIAL HISTORIC
4(f) STATEMENT
UNIQUE & PRIME FARMLANDS
PROPOSED CORRIDOR
ROUTE 44
1000
1000
2000
3000
4000
SCALE IN FEET
PREPARED APR. 1979
MAP 4-C
REVISED OCT. 1984
PLYMPTON
KINGSTON
CARVER
PLYMOUTH
Plympton
North Plymouth
PLYMOUTH HARBOR
PLYMOUTH HISTORIC DISTRICT
CAMP NEKON
PARTING WAYS CEMETERY
ANNASNAPPET HOUSE
COLES MILL
LUCAS FAMILY CEMETERY
4-M-5
North Carver
Cedar Swamp
Billington Sea
Ridge Hill
Jones River
Muddy Pond
Indian Pond
Smelt Pond
Darby Pond
Little Pond
Triangle Pond
Narragansett Pond
Wenham Pond
Shurtleff Corner
INTERCHANGE


ZONING
PROPOSED CORRIDOR
COMMERCIAL
AGRICULTURAL / RESIDENTIAL
INDUSTRIAL
FOR PLYMOUTH ONLY
1 RURAL
2 MEDIUM LOT
WETLANDS
3 SMALL LOT
4 MIXED - DENSITY
WATERFRONT
5 MULTI - FAMILY
ROUTE 44
1000 1000 2000 3000 4000
SCALE IN FEET
PREPARED APR. 1979
MAP 4-D
REVISED OCT. 1984
KINGSTON
PLYMPTON
Plympton
CARVER
PLYMOUTH HARBOR
Goose Point Channel
High Cliff
North Plymouth
Billington Sea
Little Pond
Big West Pond
Wenham Pond
Shurtleff Corner
Cedar Swamp
Coles Hill


TOPOGRAPHY
ELEVATIONS
40-79
80-119
120-159
160-179
180-219
220-279
PROPOSED CORRIDOR
ROUTE 44
SOURCE: USGS 1962
1000
2000
3000
4000
SCALE IN FEET
PREPARED APR. 1979
MAP 4-E
REVISED OCT. 1984
PLYMPTON
PLYMOUTH HARBOR
Goose Point Channel
Indian Pond
Muddy Pond
Smelt Pond
Little Pond
Billington Sea
Hathaway Point
Darby Pond
Cedar Swamp
Cooper Pond
Wenham Pond
Muddy Pond
Little West Pd
Big West Pond
Cranberry Bogs
North Carver
Bonney Pond
Plympton
High Cliff


SOILS
CARVER AND GLOUCESTER
CARVER
HINCKLEY
MERRIMAC
PEAT
GLOUCESTER
ENFIELD
MUCK
FRESH WATER MARSH
SANDED MUCK
MISC. SOILS
PROPOSED CORRIDOR
ROUTE 44
SOURCE: SCS, 1969
1000 1000 2000 3000 4000
SCALE IN FEET
PREPARED APR. 1979
MAP 4-F
REVISED OCT. 1984
KINGSTON
PLYMOUTH HARBOR
PLYMOUTH
North Plymouth
Plymouth Rock
Coles Hill
Goose Point Channel
Billington Sea
Smelt Pond
Muddy Pond
Indian Pond
Little Pond
Darby Pond
Wenham Pond
Cooper Pond
Hathaway Point
Big West Pond
Little West Pd
South Pond
Triangle Pond
INTERCHANGE
High Cliff
Tidal Flat
White Flat


GROUNDWATER RESOURCES
WELL LOCATIONS
MUNICIPAL
POTENTIAL MUNICIPAL
INSTITUTIONAL
INDUSTRIAL
GROUNDWATER ELEVATION (ABOVE M.S.L.)[1]
GENERALIZED SURFICIAL GEOLOGY[2]
OUTWASH PLAINS AND KAMEFIELDS, SAND MEMBER
OUTWASH PLAINS AND KAMEFIELDS, GRAVEL MEMBER
MONKS HILL MORAINE
GROUND MORAINE OF GLACIAL READVANCES
PROPOSED CORRIDOR
ROUTE 44
SCALE IN FEET
1000 0 1000 2000 3000 4000
SOURCE: 1. S.R.P.E.D.D., 1977
2. WILLAMS AND TASKER, 1974
PREPARED APR. 1979
MAP 4-G
REVISED OCT. 1984
GRASSY HOLE
PLYMPTON
KINGSTON
CARVER
PLYMOUTH HARBOR
North Plymouth
Plymouth
Plympton
North Carver
East Carver
Indian Pond
Muddy Pond
Smelt Pond
Darby Pond
Wenham Pond
Cedar Swamp
Billington Sea
Little Pond
Little Muddy Pond
Shurtleff Corner
Goose Point Channel
High Cliff
Ridge Hill
Winnetuxet
Annasnappet
Jones River
Little West Pd
Big West Pond
Morton Park
Hathaway Point
Cooper Pond
Fresh Meadow Pond


SURFACE WATER RESOURCES
SURFACE WATER BODY
PROPOSED CORRIDOR
(A-H) WELL SAMPLE LOCATION
WATER SAMPLING STATION (JMCA, 1980 and 1983)
(1-10) WATER SAMPLING LOCATION (MASS. DWPC, RPA, 1974)
(1-15) WATER SAMPLING STATION (JMCA, 1977)
ROUTE 44
SCALE IN FEET
PREPARED APR. 1979
MAP 4-H
REVISED OCT 1984
D LOCATION ON NORTH SHORE OF LITTLE SOUTH POND
4-M-5
PLYMPTON
KINGSTON
CARVER
PLYMOUTH
North Plymouth
Plymouth
North Carver
Billington Sea
Indian Pond
Muddy Pond
Smelt Pond
Little Pond
Cooper Pond
Wenham Pond
Fresh Meadow Pond
Cedar Swamp


FLOOD HAZARD
SPECIAL FLOOD HAZARD AREA
PROPOSED CORRIDOR
ROUTE 44
SCALE IN FEET
1000 1000 2000 3000 4000
SOURCE U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
PREPARED APR. 1979
MAP 4-I
REVISED OCT. 1984
4-M-5
KINGSTON
PLYMPTON
Plympton
CARVER
North Carver
PLYMOUTH
North Plymouth
PLYMOUTH HARBOR
Goose Point Channel
Ridge Hill
Dennetts Pond
Jones River Brook
Indian Pond
Smelt Pond
Little Smelt Pond
Rocky Pond
Monks Hill
Muddy Pond
Lyon Pond
Cedar Swamp
Billington Sea
Hathaway Point
Little Pond
Triangle Pond
Little Muddy Pond
Darby Pond
Little Clear Pond
Narragansett Pond
Cooper Pond
Wenham Pond
Fresh Meadow Pond
Big West Pond
Little West Pd
Grassy West Pond
Spring Pond
Shurtleff Corner
INTERCHANGE
Cranberry Bogs
Coles Hill
Plymouth Rock
High Cliff


WETLANDS
WOODED SWAMP
(PALUSTRINE FORESTED)
SHRUB SWAMP
(PALUSTRINE SCRUB/SHRUB)
SHALLOW MARSH
(PALUSTRINE EMERGENT)
DEEP MARSH
(PALUSTRINE EMERGENT)
1-17 WETLAND NUMBER
BOG
CRANBERRY BOG
ABANDONED CRANBERRY BOG
PROPOSED CORRIDOR
ROUTE 44
1000 0 1000 2000 3000 4000
SCALE IN FEET
PREPARED APR. 1979
MAP 4-J
REVISED OCT. 1984
4-M-5
KINGSTON
North Plymouth
PLYMOUTH
PLYMOUTH HARBOR
Billington Sea
North Carver
East Carver
Indian Pond
Muddy Pond
Smelt Pond
Triangle Pond
Little Pond
Darby Pond
Cooper Pond
Wenham Pond
Hathaway Point
Ridge Hill
Shurtleff Corner

RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN

STATION 395+00 to STATION 400+25

& CONNECTORS A,B,C & D

WETLANDS

3,2,1 WETLAND NUMBER

PALUSTRINE EMERGENT

PALUSTRINE FORESTED

PALUSTRINE OPEN WATER

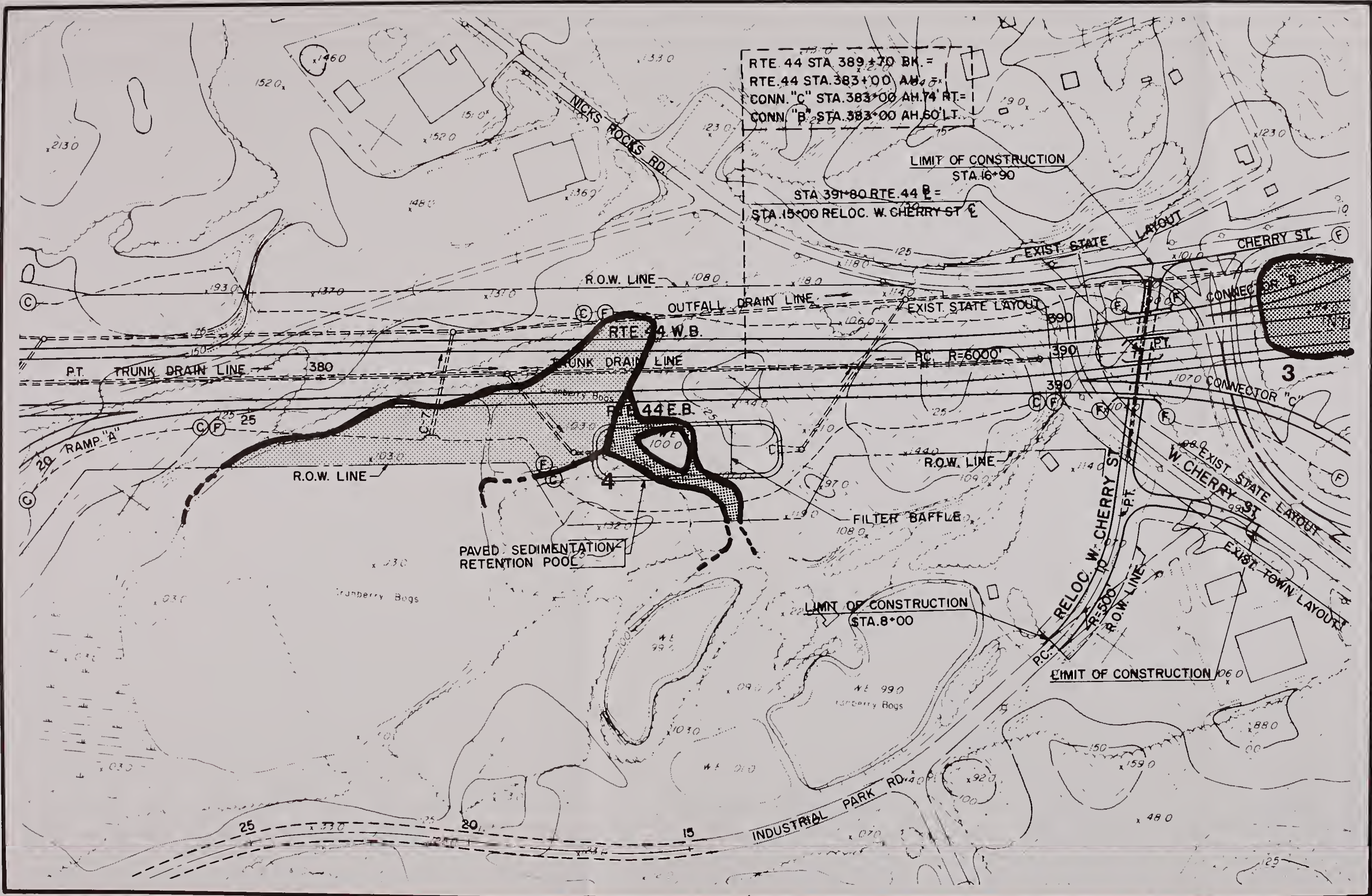
HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-1



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN

STATION 371+00 to STATION 395+00

WETLANDS

4,3 WETLAND NUMBER

PALUSTRINE EMERGENT

PALUSTRINE FORESTED

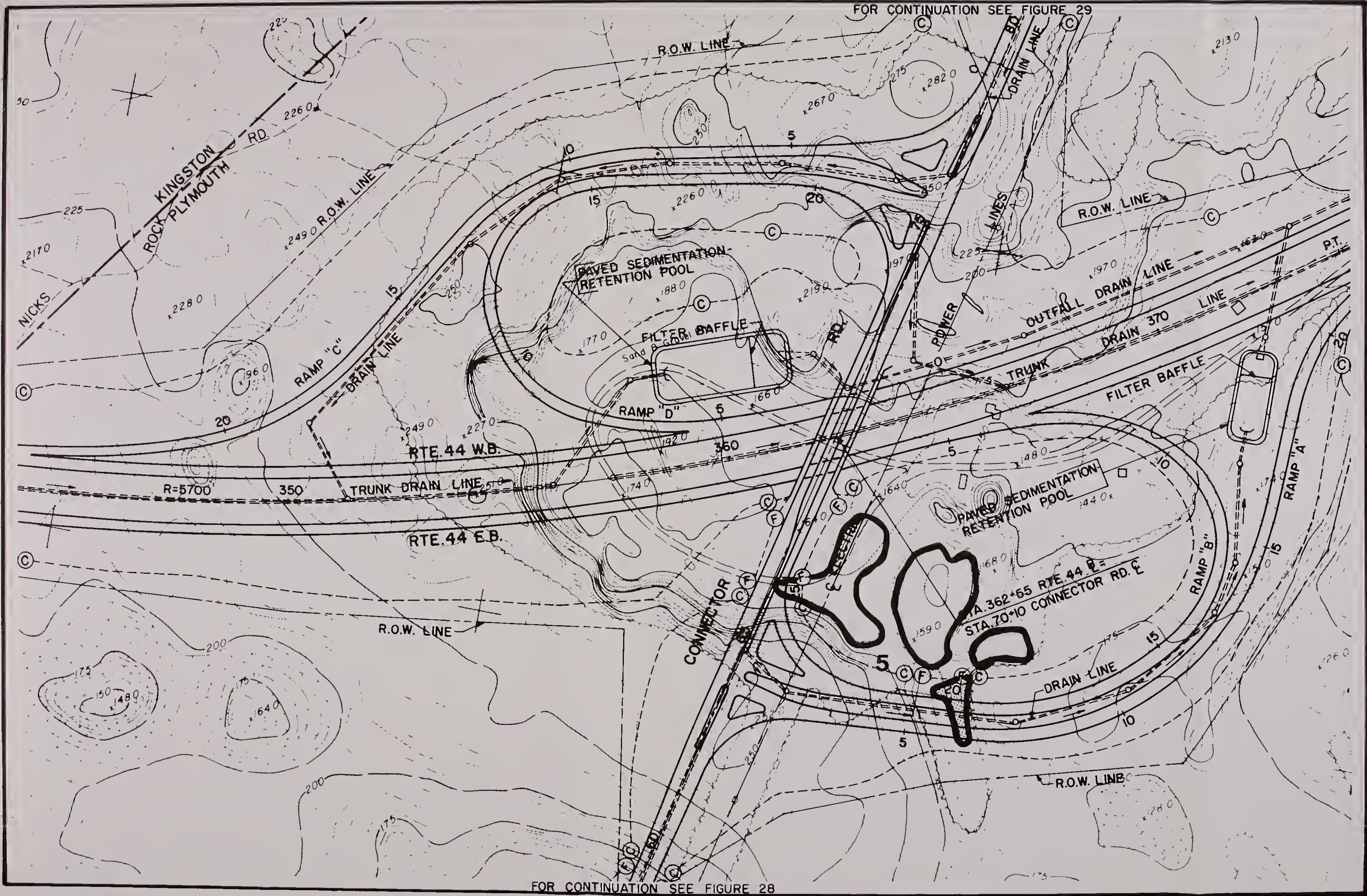
PALUSTRINE OPEN WATER

HORIZONTAL	0	200'	400'	600'
VERTICAL	0	20'	40'	60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-2



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN

STATION 344+00 to STATION 371+00

WETLANDS

5 WETLAND NUMBER

PALUSTRINE EMERGENT

PALUSTRINE OPEN WATER

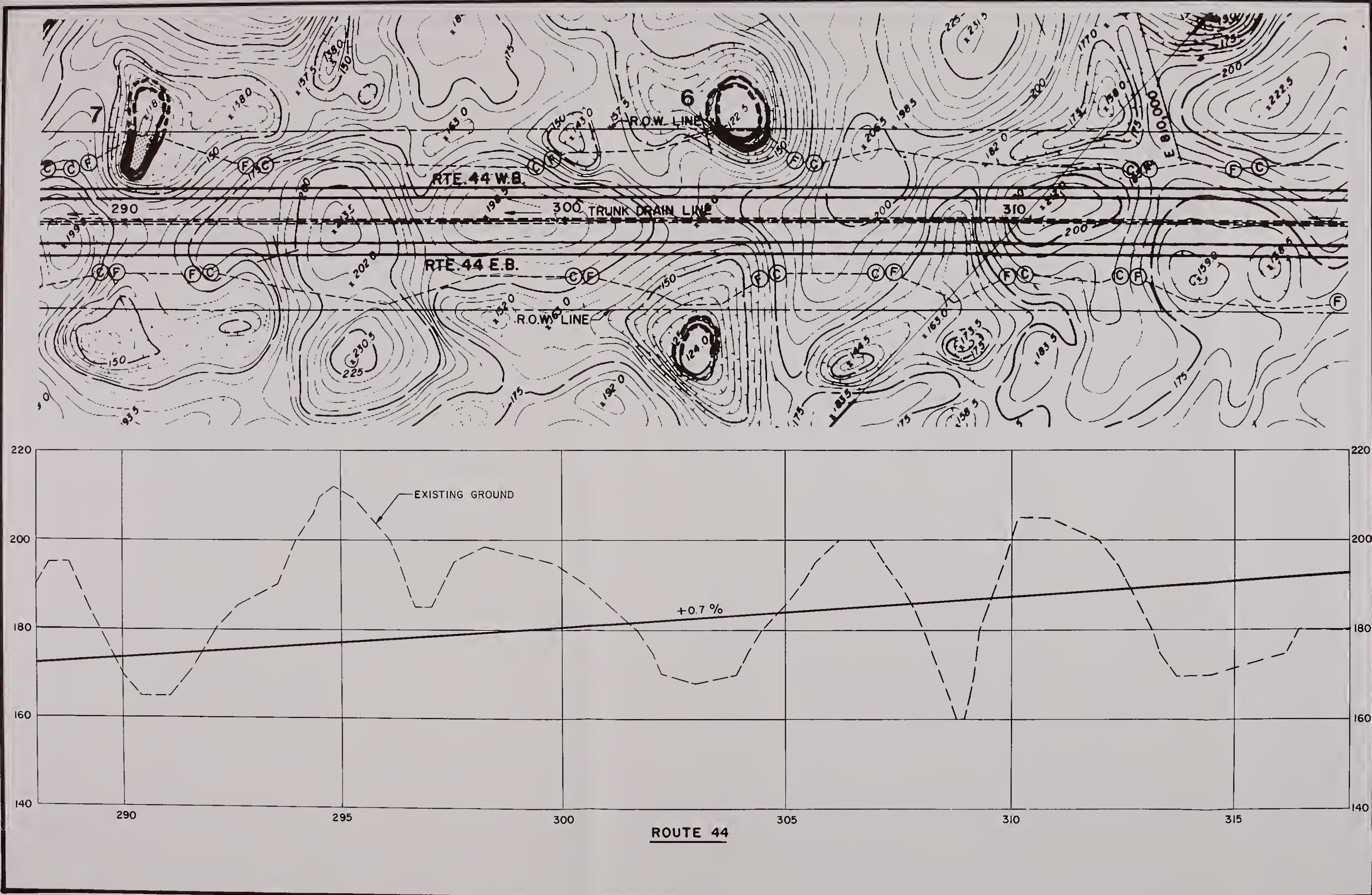
HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-3



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN & PROFILE

STATION 289+00 to STATION 316+50

WETLANDS

7,6 WETLAND NUMBER

PALUSTRINE EMERGENT

PALUSTRINE SCRUB/SHRUB

PALUSTRINE OPEN WATER

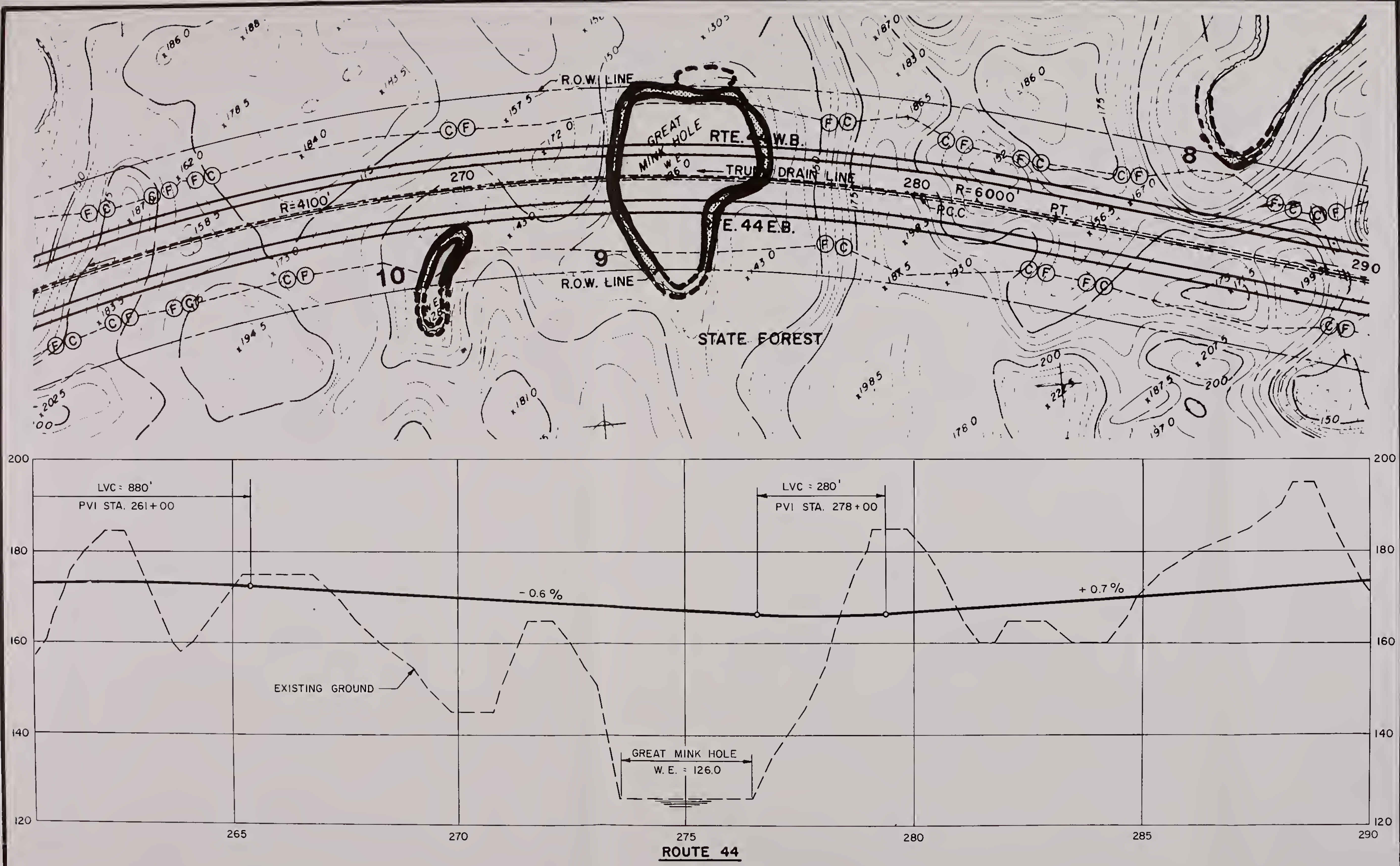
HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-4



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN & PROFILE

STATION 261+00 to STATION 289+00

WETLANDS

10,9,8 WETLAND NUMBER

PALUSTRINE EMERGENT

PALUSTRINE SCRUB/SHRUB

PALUSTRINE OPEN WATER

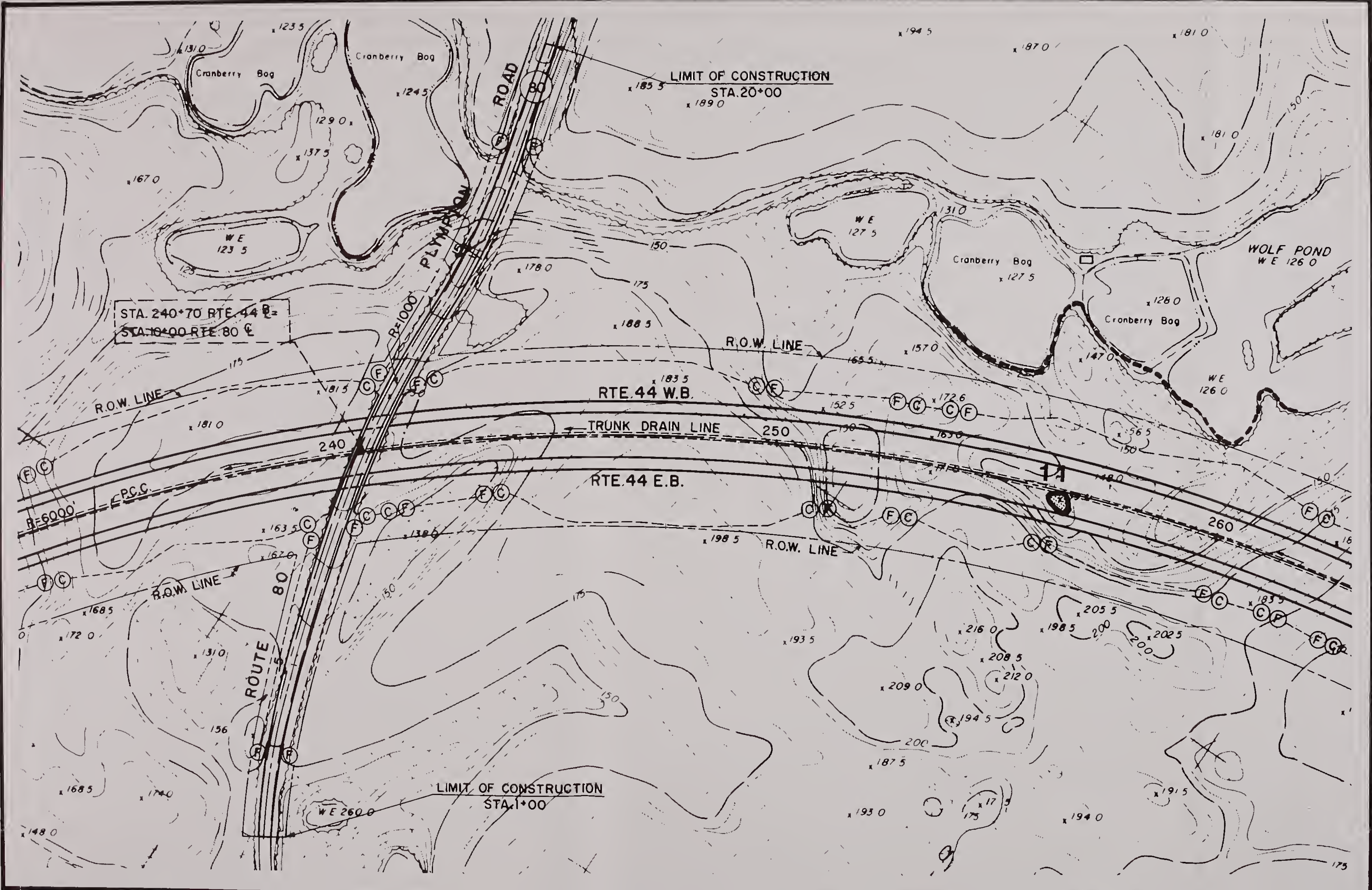
HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-5



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN

STATION 234+00 to STATION 261+50

WETLANDS

11 WETLAND NUMBER

PALUSTRINE SCRUB/SHRUB

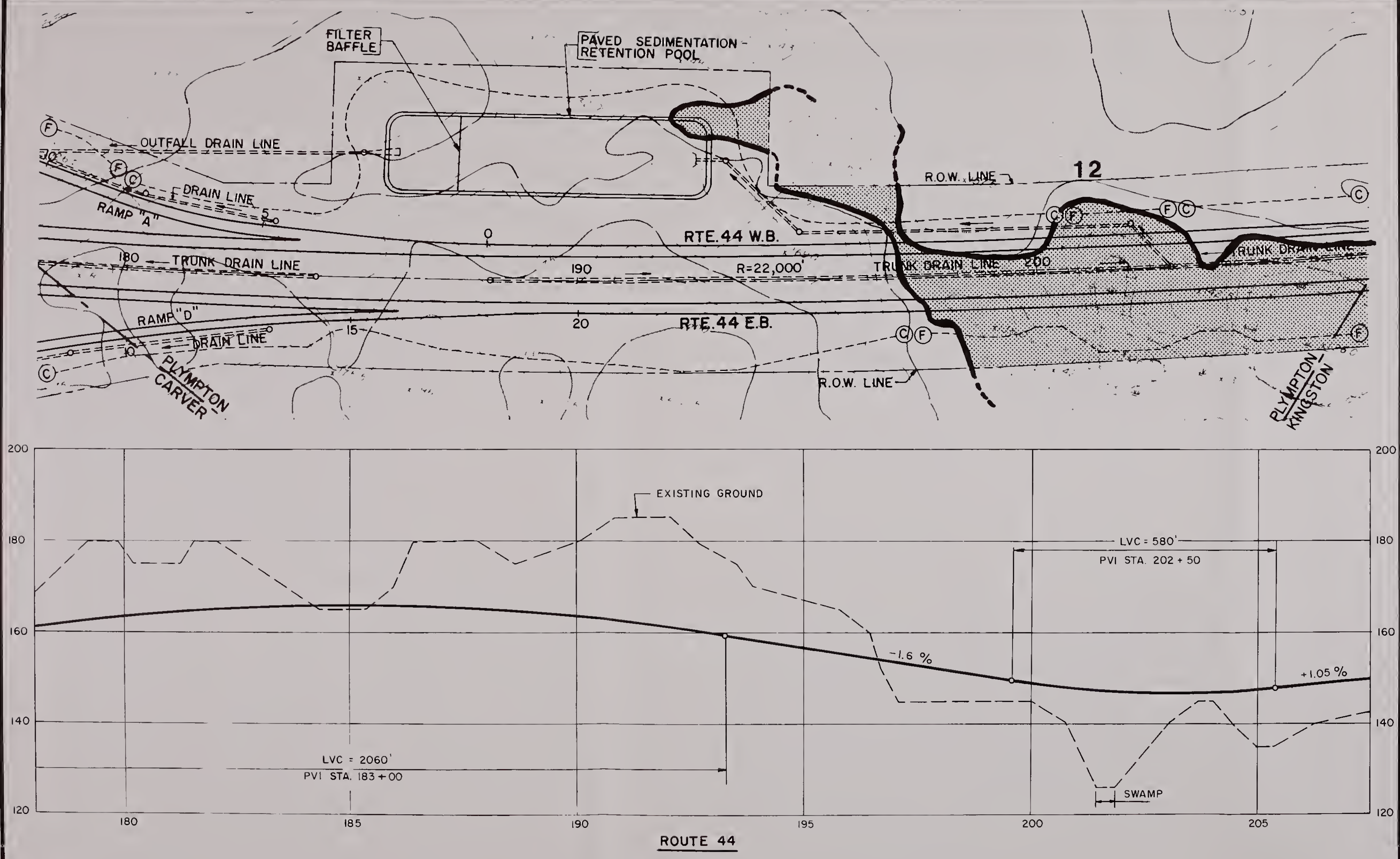
HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-6



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN & PROFILE

STATION 179+00 to STATION 206+50

WETLANDS

12 WETLAND NUMBER

PALUSTRINE SCRUB/SHRUB

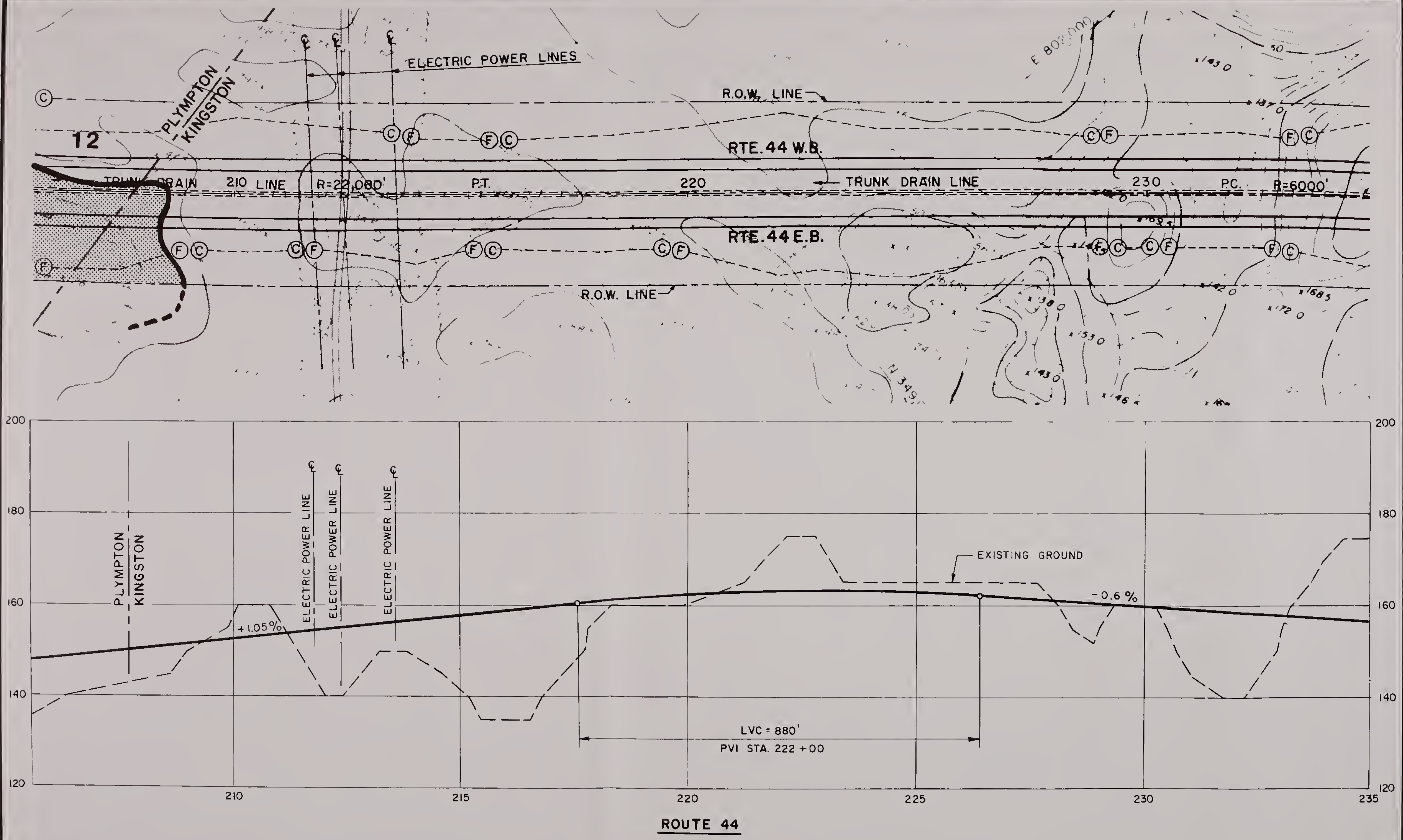
HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-7



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN & PROFILES

STATION 206+50 to STATION 234+00

WETLANDS

12 WETLAND NUMBER

PALUSTRINE SCRUB/SHRUB

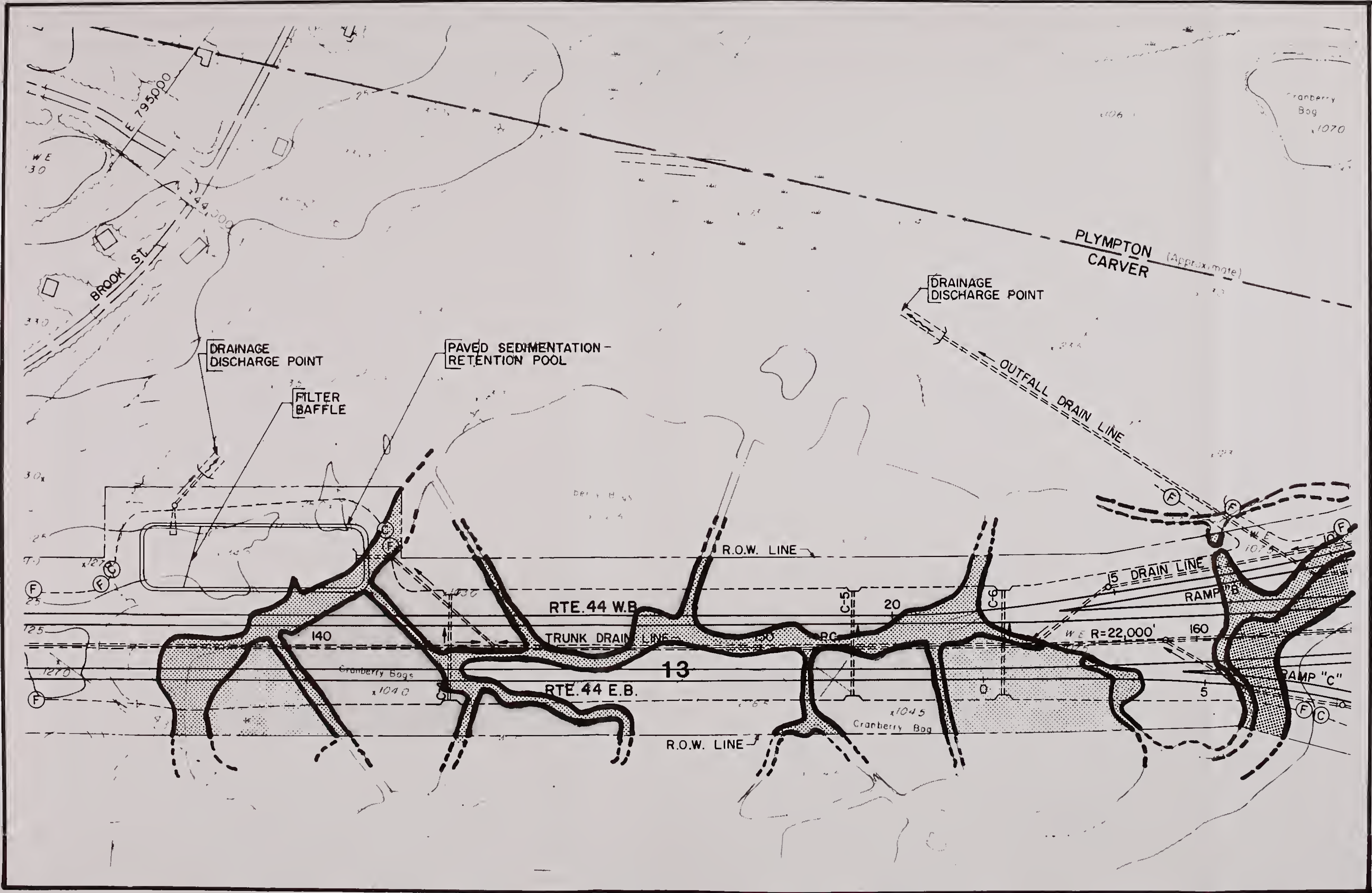
HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-8



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN

STATION 134+00 to STATION 161+00

WETLANDS

13 WETLAND NUMBER

PALUSTRINE EMERGENT

PALUSTRINE SCRUB/SHRUB

PALUSTRINE FORESTED

PALUSTRINE OPEN WATER

CRANBERRY BOG

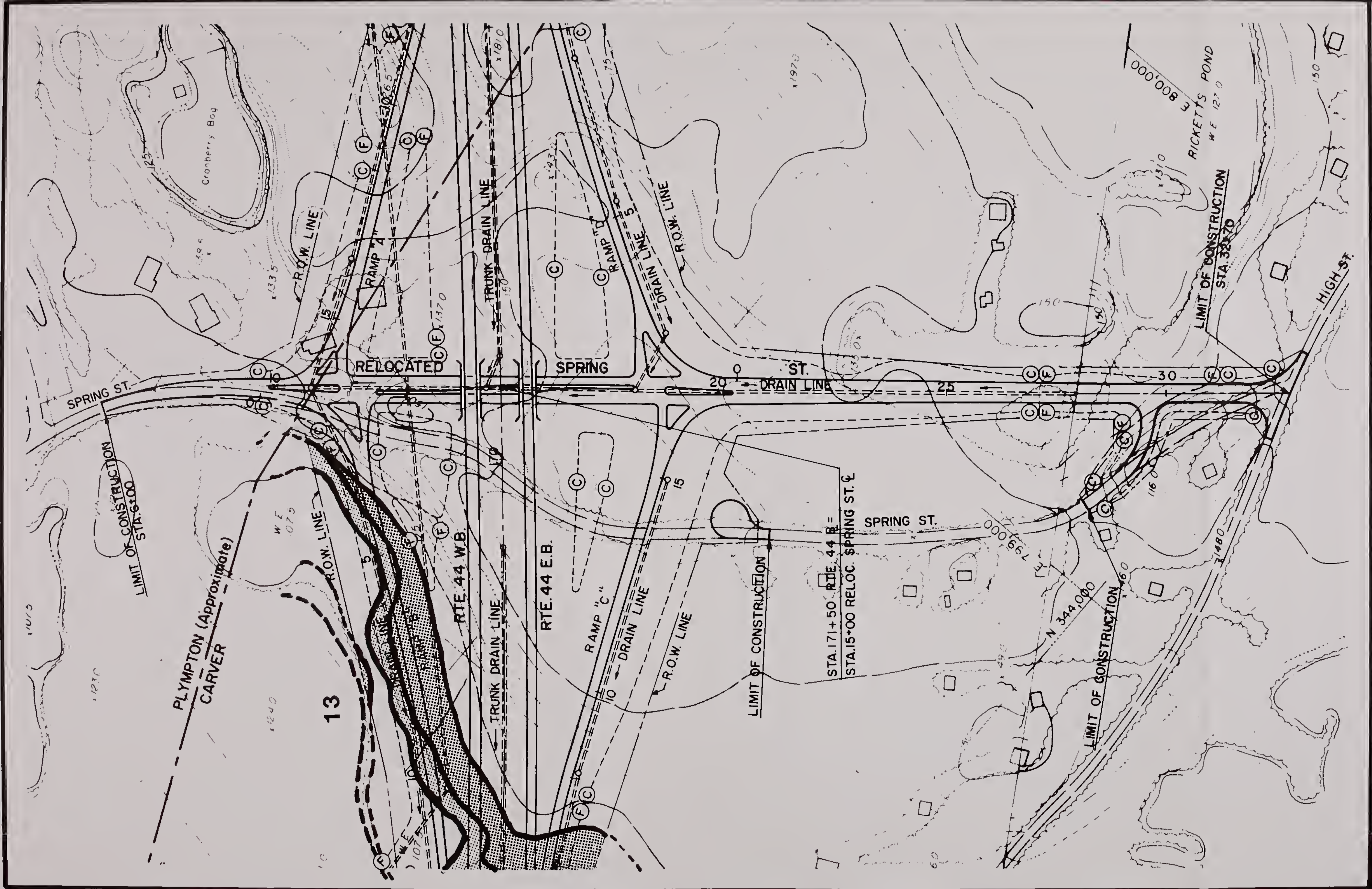
HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-9



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN

STATION 161+00 to STATION 179+00

WETLANDS

13 WETLAND NUMBER

PALUSTRINE SCRUB/SHRUB

PALUSTRINE FORESTED

PALUSTRINE OPEN WATER

HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-10

RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN

STATION 106+50 to STATION 134+00

WETLANDS

15,14 WETLAND NUMBER

PALUSTRINE SCRUB/SHRUB

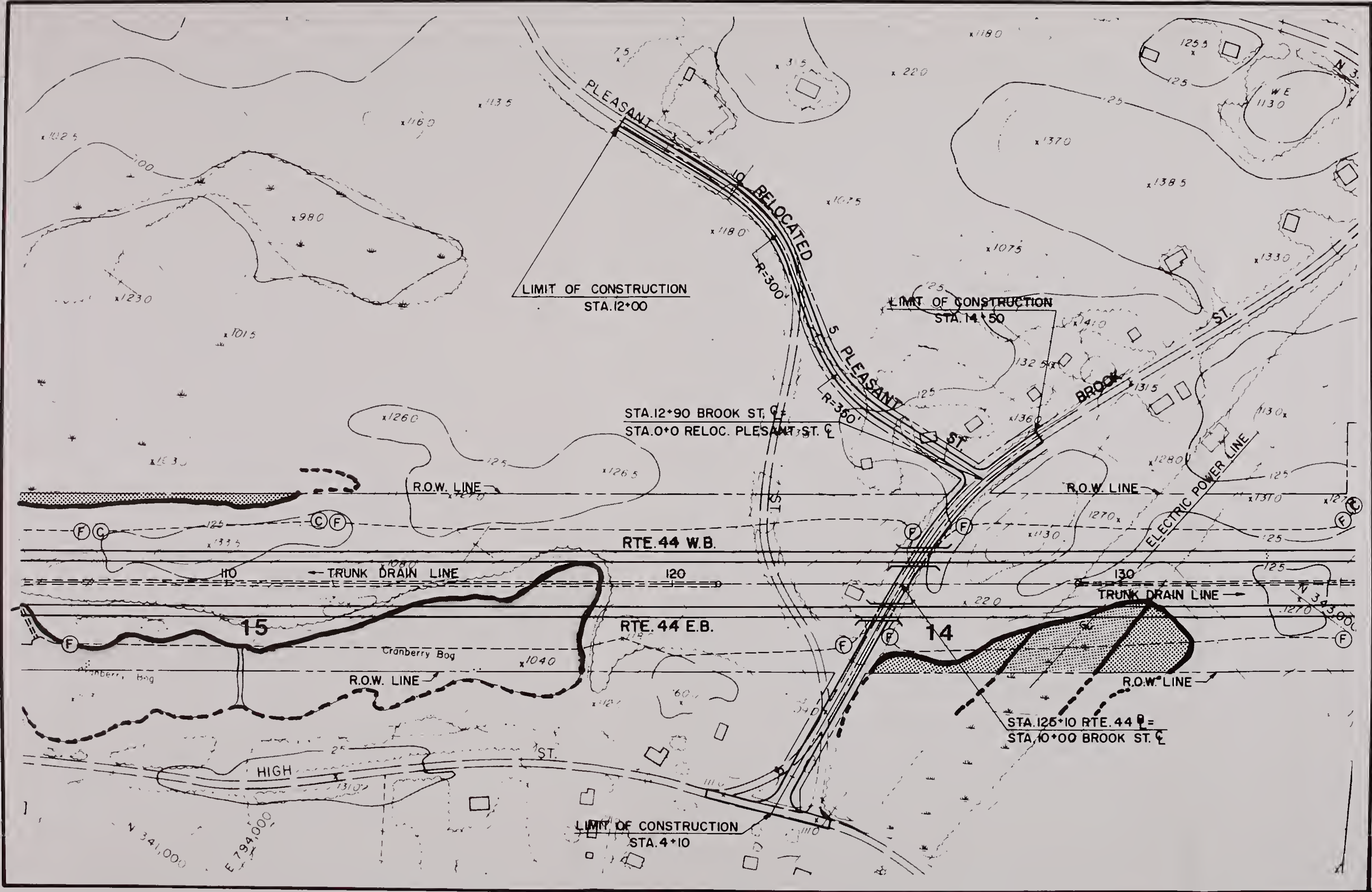
PALUSTRINE FORESTED

CRANBERRY BOG

HORIZONTAL 0 200' 400' 600'

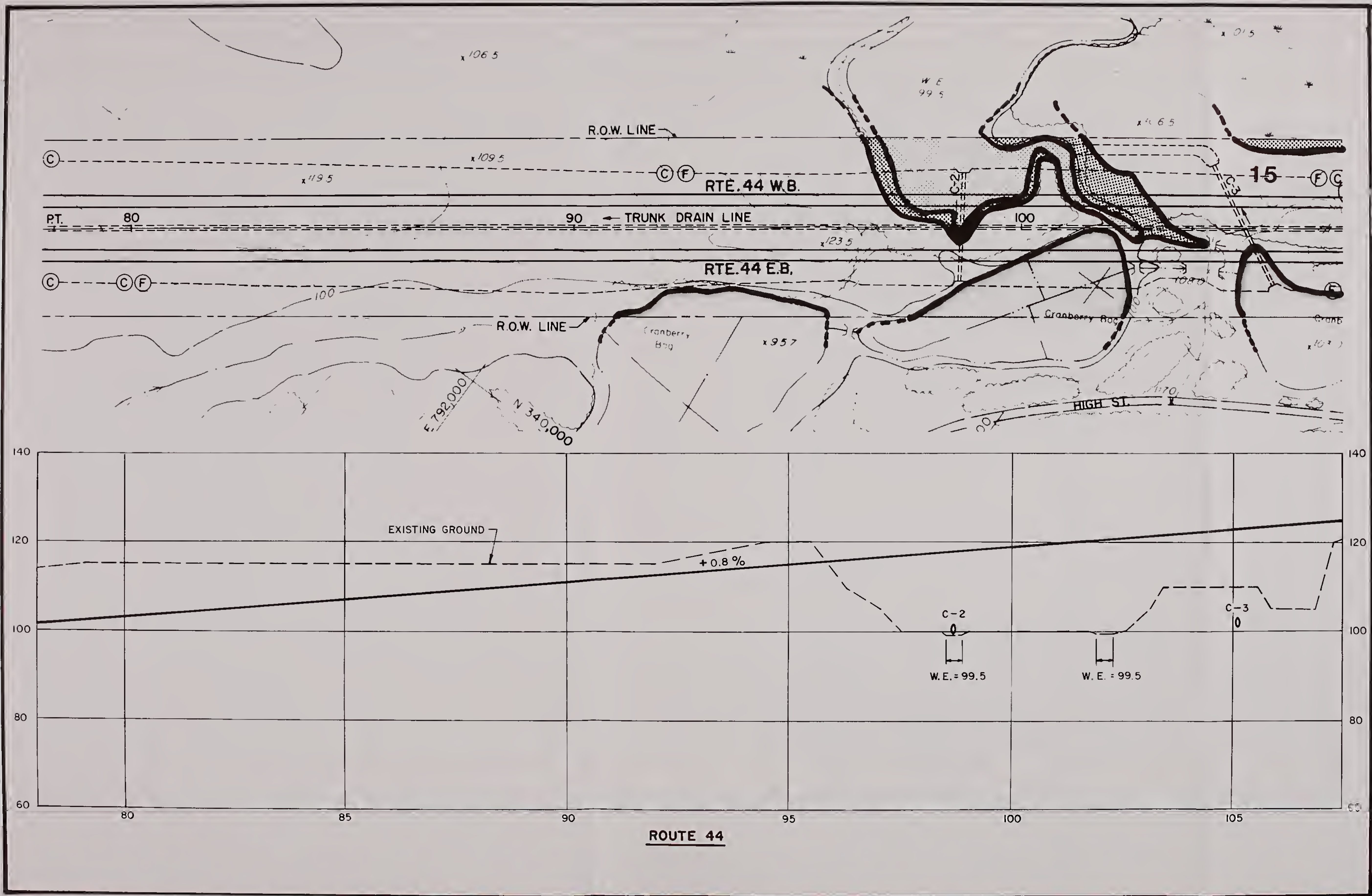
VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET



PREPARED OCT. 1984

MAP 4-J-11



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN & PROFILE

STATION 79+00 to STATION 106+50

WETLANDS

15 WETLAND NUMBER

PALUSTRINE EMERGENT

PALUSTRINE FORESTED

CRANBERRY BOG

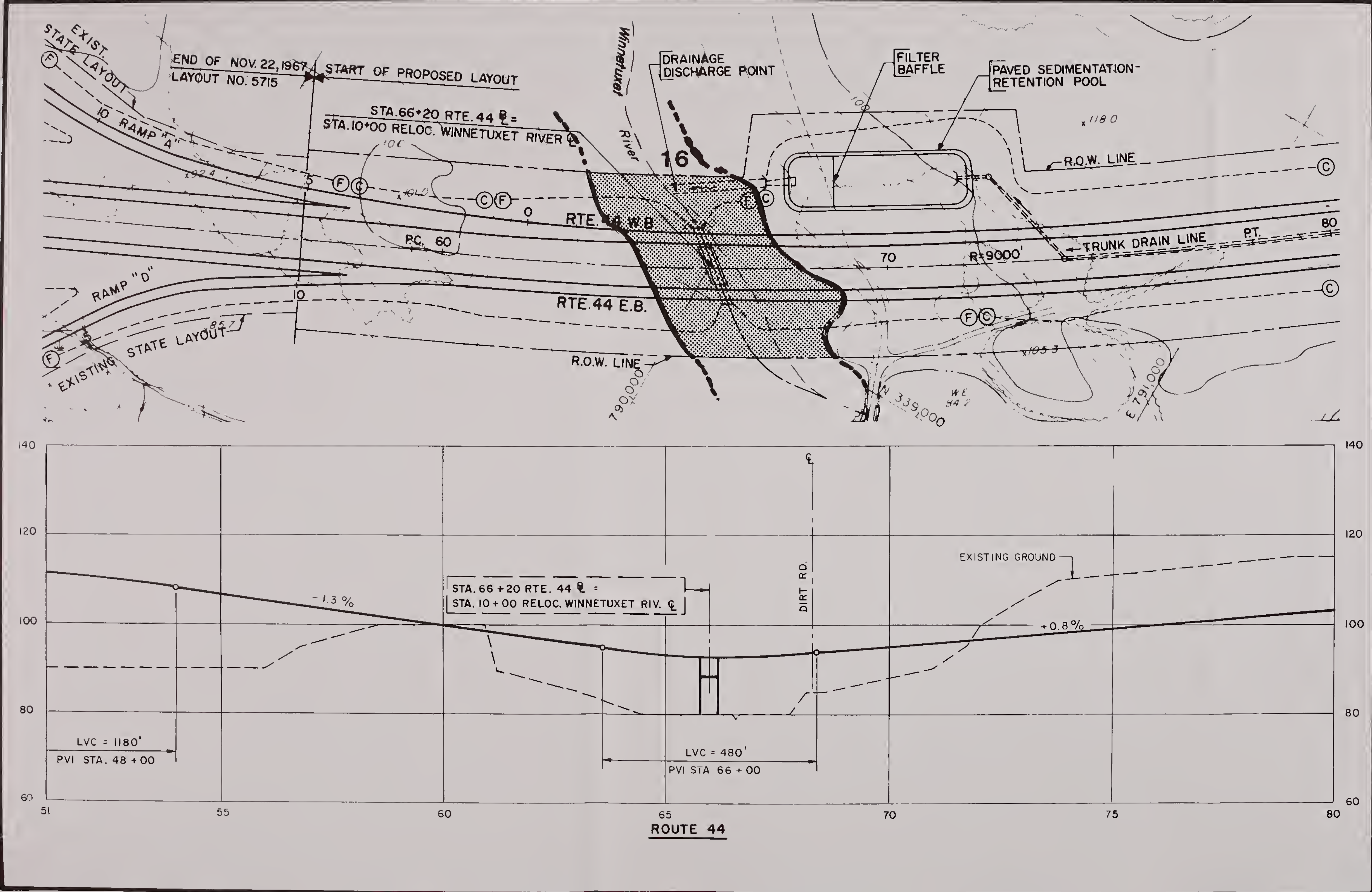
HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-12



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN & PROFILE

STATION 52+00 to STATION 79+00

WETLANDS

16 WETLAND NUMBER

PALUSTRINE FORESTED

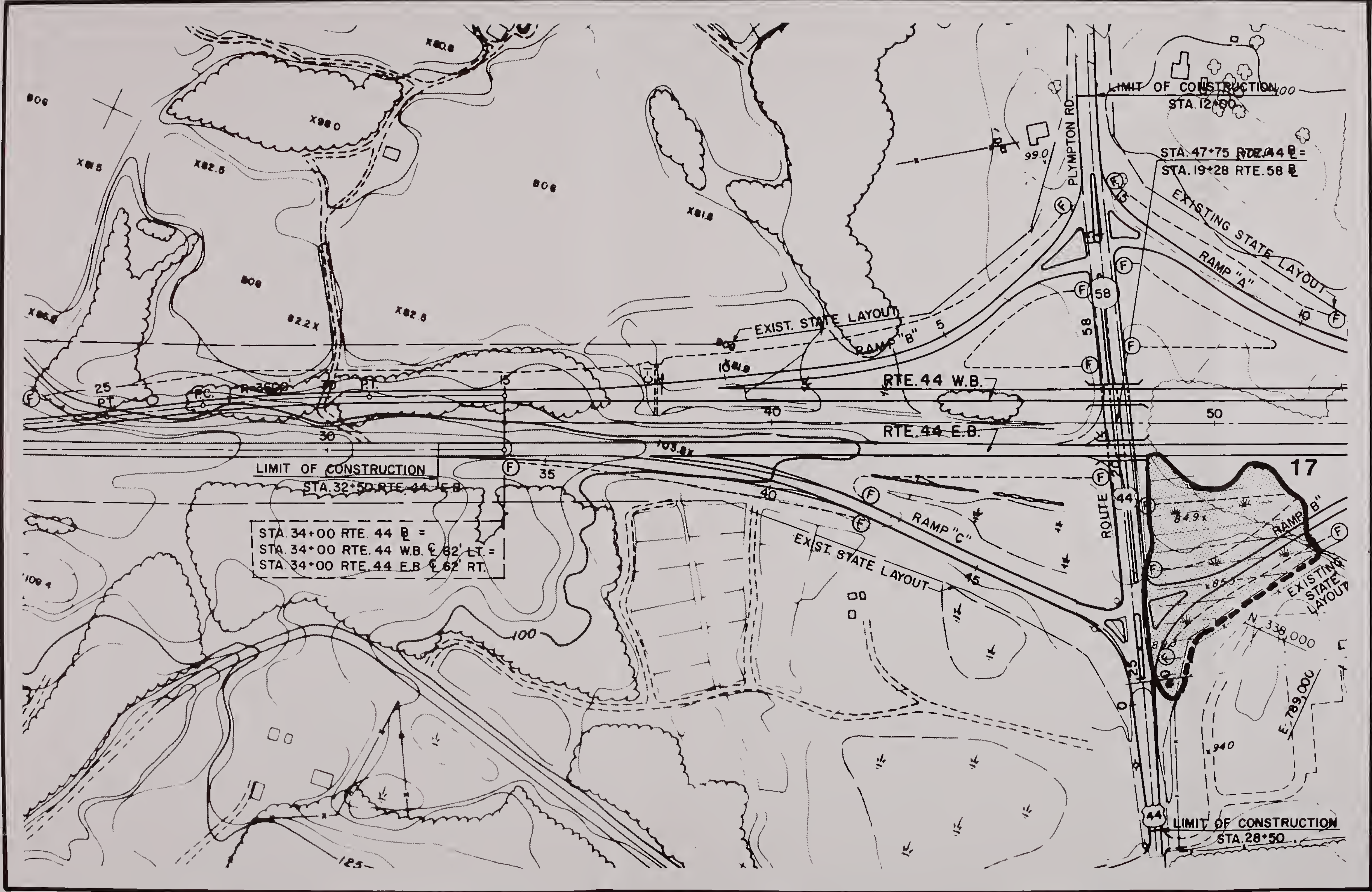
HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-13



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN

STATION 25+00 to STATION 52+00

WETLANDS

17 WETLAND NUMBER

PALUSTRINE EMERGENT

HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-J-14

RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

STATION 50+00 **to STATION** 75+00

PROPOSED WETLAND REPLACEMENT AREAS

CONTINUED ON MAP 4-J-15 (2)

PROPOSED WETLAND REPLACEMENT AREA

APPROXIMATE ADDITIONAL LAND REQUIRED TO BE PURCHASED

HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

MAP 4-J-15 (1)

RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

STATION 75+00 **to STATION** 100+00

PROPOSED WETLAND REPLACEMENT AREAS

CONTINUATION OF MAP 4-J-15 (1)

PROPOSED WETLAND REPLACEMENT AREA

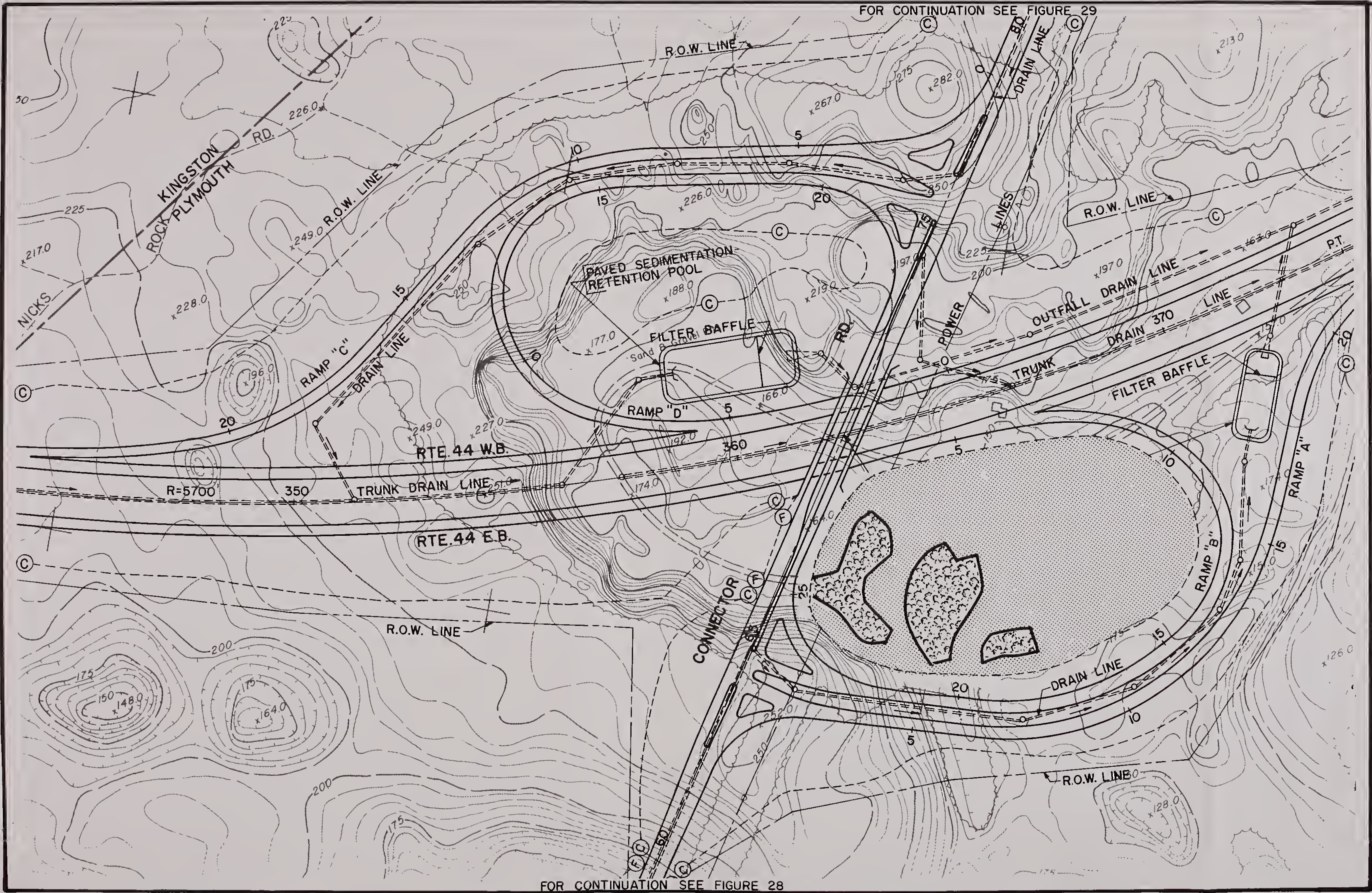
APPROXIMATE ADDITIONAL LAND REQUIRED TO BE PURCHASED

HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

MAP 4-J-15 (2)



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN

STATION 344+00 to STATION 371+00

PROPOSED WETLAND REPLACEMENT AREAS

REPLACEMENT WETLANDS

EXISTING WETLANDS

HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

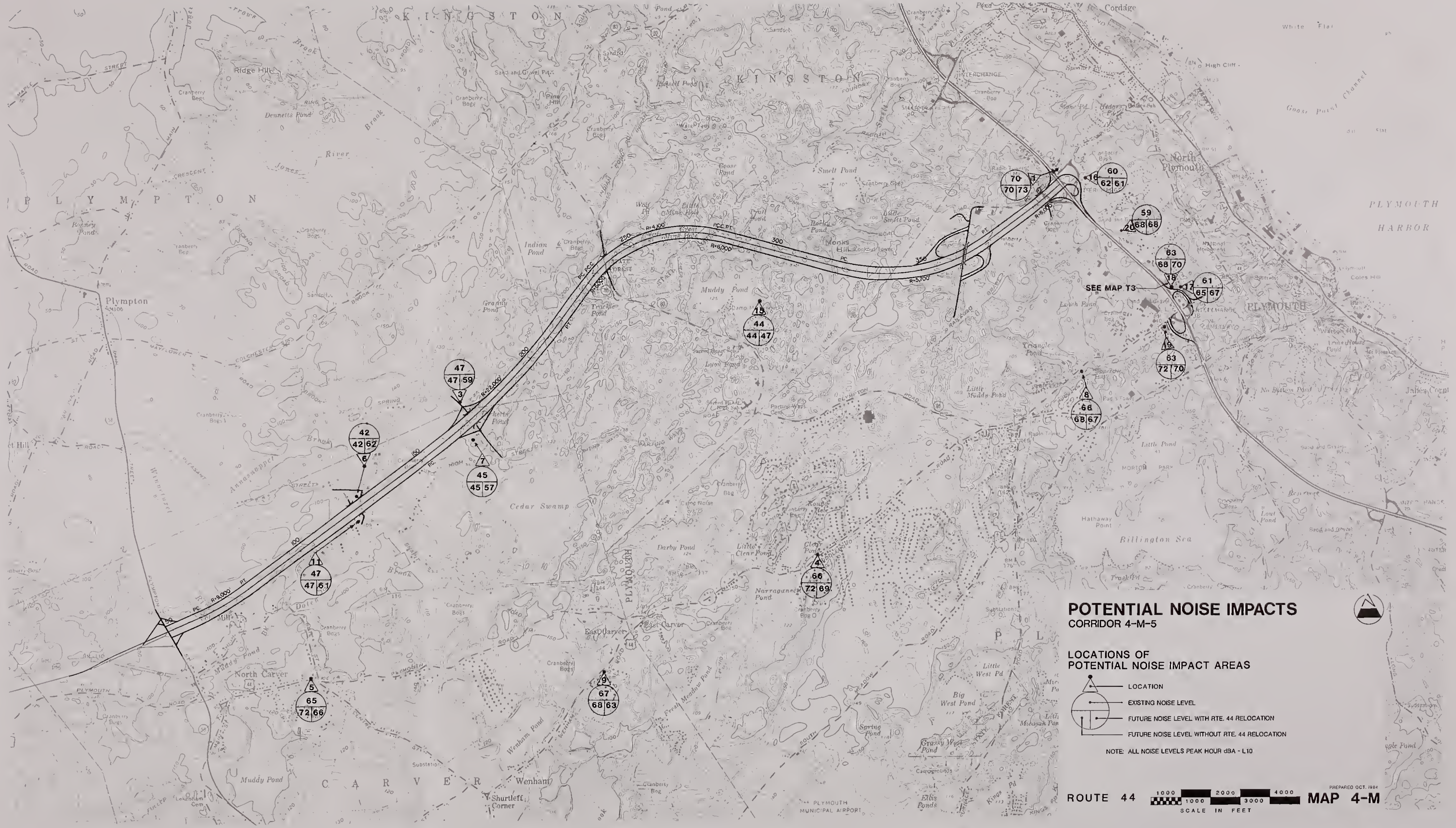
CONTOUR INTERVAL: FIVE FEET

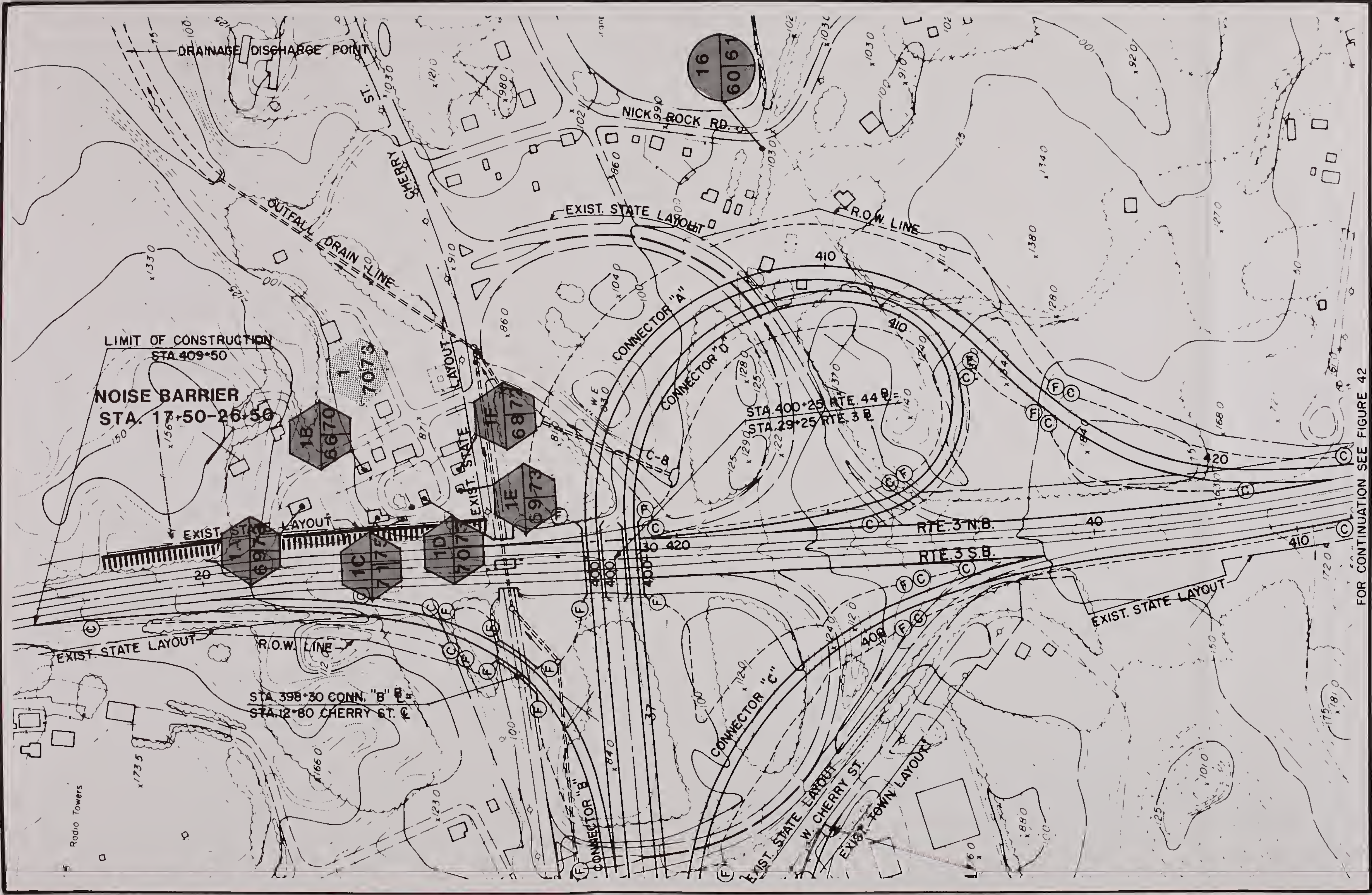
PREPARED OCT. 1984

MAP 4-J-16

VEGETATION
PROPOSED CORRIDOR
OPEN WATER
WETLAND
ABANDONED FIELD
20-40' HARDWOODS
SOFTWOODS
MIXED FOREST
40-60' HARDWOODS
SOFTWOODS
MIXED FOREST
OVER 60' HARDWOODS
SOFTWOODS
MIXED FOREST
ROUTE 44
SOURCE: MAC CONNELL MAPS, 1972
1000 1000 2000 3000 4000
SCALE IN FEET
PREPARED APR. 1979
MAP 4-K
REVISED OCT. 1984
PLYMPTON
Plympton
Ridge Hill
Smelt Pond
Indian Pond
Muddy Pond
Darby Pond
Little Pond
Billington Sea
Hathaway Point
North Plymouth
PLYMOUTH
PLYMOUTH HARBOR
Goose Point Channel
Cooper Pond
Wenham Pond
Wenham
Shurtleff Corner
Big West Pond
Little West Pd
South Pond
Triangle Pond


AIR QUALITY
PREFERRED ALTERNATIVE 4-M-5
ROADWAY LINKS FOR MESOSCALE ANALYSIS
MICROSCALE ANALYSIS LOCATIONS
ROUTE 44
1000 2000 4000
1000 3000
SCALE IN FEET
PREPARED APR. 1979
MAP 4-L
REVISED OCT. 1994
PLYMPTON
KINGSTON
CARVER
PLYMOUTH HARBOR
North Plymouth
Plymouth
Plympton
North Carver
East Carver
Cedar Swamp
Smelt Pond
Muddy Pond
Indian Pond
Darby Pond
Little Pond
Hathaway Point
Goose Point Channel
INTERCHANGE
ROUTE 3 INTERCHANGE
SAMOSET INTERCHANGE
SPRING STREET INTERCHANGE
BROOK STREET OVERPASS
Shurtleff Corner
Cranberry Bogs


POTENTIAL NOISE IMPACTS
CORRIDOR 4-M-5
LOCATIONS OF
POTENTIAL NOISE IMPACT AREAS
LOCATION
EXISTING NOISE LEVEL
FUTURE NOISE LEVEL WITH RTE. 44 RELOCATION
FUTURE NOISE LEVEL WITHOUT RTE. 44 RELOCATION
NOTE: ALL NOISE LEVELS PEAK HOUR dBA - L10
PREPARED OCT. 1984
ROUTE 44
1000 2000 4000
1000 3000
SCALE IN FEET
MAP 4-M
SEE MAP T3
KINGSTON
PLYMPTON
Plympton
CARVER
North Carver
East Carver
PLYMOUTH
North Plymouth
PLYMOUTH HARBOR
Cedar Swamp
Billington Sea
PLYMOUTH MUNICIPAL AIRPORT



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN

STATION 395+00 to STATION 400+25

& CONNECTORS A,B,C & D

POTENTIAL NOISE IMPACTS CORRIDOR 4-M-5

NOISE MEASUREMENT LOCATION

SAMPLING LOCATION

FUTURE L10 dBA

EXISTING L10 dBA

POTENTIAL IMPACT LOCATION

IMPACT LOCATION

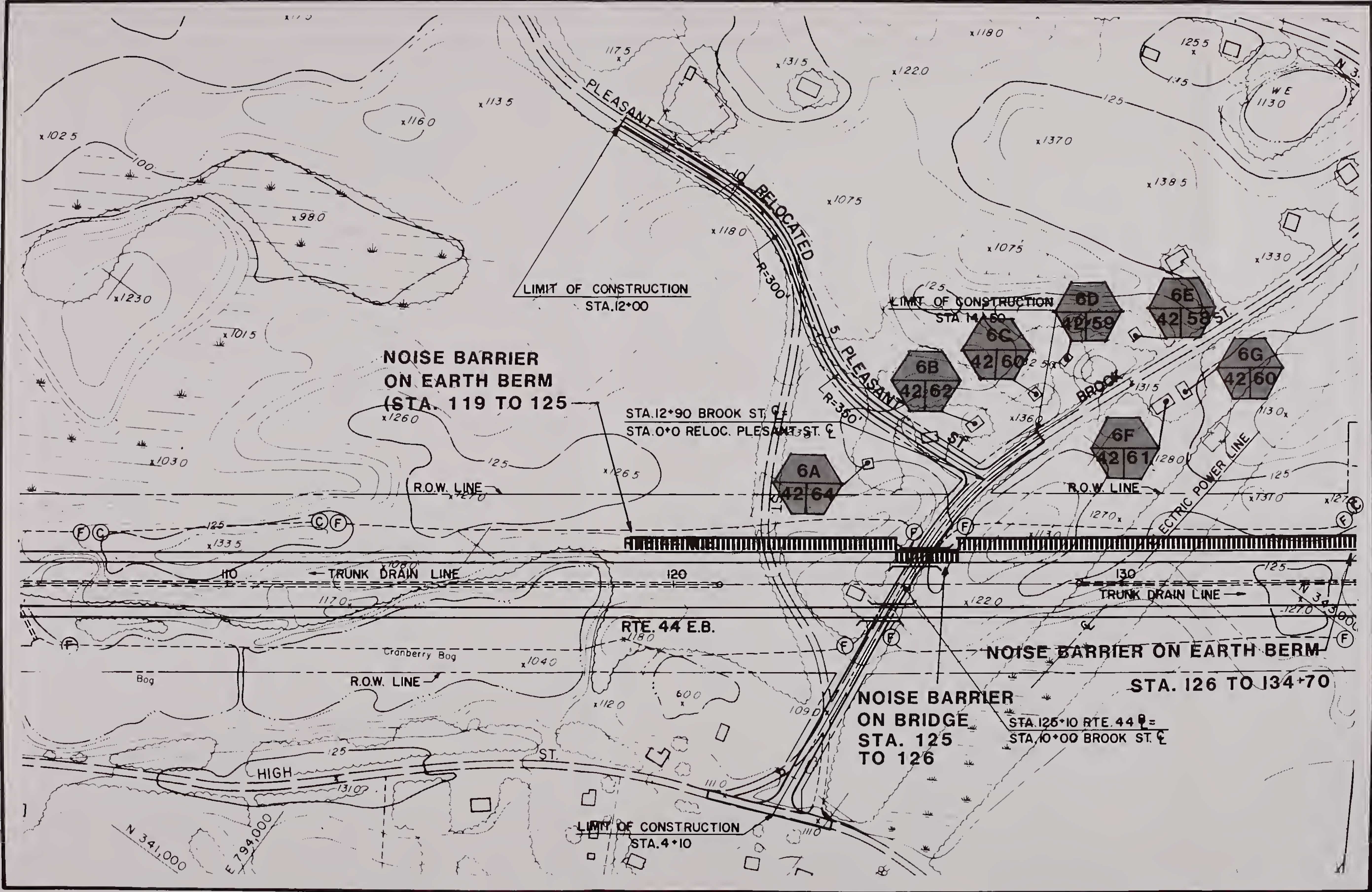
FUTURE L10 dBA

EXISTING L10 dBA

NOISE BARRIER

PREPARED OCT. 1984

MAP 4-M-1



RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN

STATION 106+50 to STATION 134+00

POTENTIAL NOISE IMPACTS CORRIDOR 4-M-5

NOISE MEASUREMENT LOCATION

SAMPLING LOCATION

FUTURE L10 dBA

EXISTING L10 dBA

POTENTIAL IMPACT LOCATION

IMPACT LOCATION

FUTURE L10 dBA

EXISTING L10 dBA

NOISE BARRIER

PREPARED OCT. 1984

MAP 4-M-2

RELOCATION OF ROUTE 44

CARVER-PLYMPTON-KINGSTON-PLYMOUTH

MASSACHUSETTS

PLAN-ROUTE 3

STATION 72+00 to STATION 90+00

POTENTIAL NOISE IMPACTS CORRIDOR 4-M-5

NOISE MEASUREMENT LOCATION

- SAMPLING LOCATION
- FUTURE L10 dBA
- EXISTING L10 dBA

POTENTIAL IMPACT LOCATION

- IMPACT LOCATION
- FUTURE L10 dBA
- EXISTING L10 dBA

NOISE BARRIER

HORIZONTAL 0 200' 400' 600'

VERTICAL 0 20' 40' 60'

CONTOUR INTERVAL: FIVE FEET

PREPARED OCT. 1984

MAP 4-M-3

SECTION 5

SECTION 4(f) EVALUATION

1. INTRODUCTION

Section 4(f) of the U.S. Department of Transportation Act of 1966 as amended states that publicly owned parks, recreation land, wildlife/waterfowl refuge areas, or historic sites of national, state, or local significance may be used for Federal Aid Projects only 1) if there is no feasible and prudent alternative to the use of such land, and 2) if such projects include all possible planning to minimize harm to these lands. The official having jurisdiction over 4(f) land determines its "significance" and the agency conducting the Environmental Impact Statement customarily seeks such a determination from that official. Sites which are on, or are eligible for inclusion in, the National Register of Historic Places are to be included in this category.

2. DESCRIPTION OF PROJECT

The preferred Alternative 4-M-5 and the other alternatives studied, as well as the purpose and need for the proposed action, were described previously in SECTIONS 1 and 2.

3. DESCRIPTION OF SECTION 4(f) LANDS

KINGSTON STATE FOREST

Kingston State Forest is an irregularly shaped area of about 147 acres, supervised by the Division of Forests and Parks, Massachusetts Department of Environmental Management. It is used entirely for passive recreation such as riding, hiking, nature study and hunting, as well as for growing wood crops. The Forest contains sapling sized trees or larger of planted Norway spruce, red pine and white pine; the natural forest cover includes: white pine, pitch pine, scarlet oak, white oak, red maple, poplar and tupelo.

There are no fields, meadows or water bodies, but the Forest does adjoin Pratt Pond along its eastern boundary. Wildlife includes red fox, raccoon, skunk, squirrels, rabbit and some deer. Birds include ruffed grouse, crows, hawks and song birds such as chickadees. There are box turtles, snakes and other small reptiles. There are no known rare or endangered species. See FIGURE 5.3.1.

No figures are available for usage of Kingston State Forest because of the passive nature of the available activities. Access to the Forest is from Route 80 which passes through it near its western extremity; unimproved gravel roads traverse it in various places.

Based upon the above described multiple uses of the Forest and upon the fact that there is no plan designating park or recreation areas within the Forest, as distinguished from land used for growing wood crops, Section 4(f) is not strictly applicable (See 23CFR771.135(e)). In reaching this conclusion we have also considered the facts that there are no improvements within the State Forest for park/recreational usage or any documentation indicating that there

is a recognizable level of actual use of the land for park/recreational purposes. Therefore, the evaluation of impacts to the State Forest is presented in this section on the basis that the adjoining lands of Camp Nekon are covered by Section 4(f) and, as a practical matter, our evaluation of alternatives to avoid using land from Camp Nekon provides the reasons for aligning the road through the State Forest.

No Land and Water Conservation Funds have been expended on the Kingston State Forest or Camp Nekon property. See FIGURE 5.3.2.

CAMP NEKON

Camp Nekon was purchased in 1975 by the Town of Kingston, using Town funds only, from the Plymouth Bay Girl Scouts. The principal features of its approximately 200 acres are Smelt Pond (the Town's only fresh water swimming facility located along the eastern edge of Camp Nekon approximately 2400 feet northeasterly of the proposed highway) and Monks Hill, (the second highest point of land in southeastern Massachusetts and the site of a fire watch tower). The Town estimates that as much as 90% of the tract is undeveloped; the principal developed area is the location of several buildings and tent platforms formerly used by the Girl Scouts.

The Camp can be used by the Town of Kingston only for recreation, conservation and water supply. The Town's objective is to keep the Camp in its natural state as much as possible for hunting, fishing, camping, swimming and other outdoor recreational activities. Expansion of swimming and parking facilities are possible improvements, as well as a ski slope on Monks Hill. No figures are available on usage. Access to the Camp is principally from various unimproved roads in its northern section. Unimproved gravel roads from Nicks Rock Road in Plymouth to Monks Hill Road in Kingston provide access to the top of Monks Hill.

4. EFFECT OF PROJECT ON SECTION 4(f) LAND*

KINGSTON STATE FOREST

The Kingston State Forest is shaped irregularly like a butterfly. As Route 44 cuts across its wings, 2 parcels of the Forest will be required for the right of way of Alternative 4-M-5. One parcel contains about 14.52 acres, the other about 11.53 acres for a combined total of 26.05 acres taken. Also, two small parcels, containing 1.91 acres and 3.70 acres, located on the north side of Route 44 at Route 80, will be severed from the main part of the Forest. In addition, a large 42.8 acre parcel adjacent to Pratt Pond will be isolated for a combined total of 48.41 acres isolated. See MAP 5-A.

The 3.70 acre parcel north of relocated Route 44 and east of Route 80 will remain accessible from Route 80. The other two isolated parcels will be landlocked, but will still sustain wood crops.

The effect of the highway on Kingston State Forest will be minimal because 19.62 acres will be added to the Forest as partial replacement for the 26.05

*There are minor discrepancies in the acreage of referenced parcels of Camp Nekon and Kingston State Forest due to the many 4-M alignments studied and modified; that is 4-M, 4-M-1, and 4-M-5.

acres taken for the highway, leaving a net loss of 6.43 acres. THe replacement of this 6.43 acres will be made at a location agreeable to Kingston State Forest (Department of Environmental Management - DEM). For further details see section below on Measures to Minimize Harm. The taking of land for the highway and the replacement of acreage to Kingston State Forest will rearrange the configuration of the Forest but the net effect to DEM's land will be an increase of 20.94 acres.

Alternatives 4-M, 4-M-1 and 4-N would have had only a minor effect on Kingston State Forest. Alternative 4-M would have required 3.1 acres; 4-M-1, 4.9 acres; and 4-N, 1.7 acres of State Forest land. At the request of DEM to move the alignment further north away from the shores of Muddy Pond, to avoid conflict with one of the state's rarest and most endangered plant species, the White-Bracted Boneset, (see FIGURE 5-3-3). Alternative 4-M was further modified into the final alignment called 4-M-5. This modification of the alignment away from Muddy Pond caused the further incursion into Kingston State Forest requiring the taking of 2 parcels, one containing 14.52 acres and the other 11.53 acres. The Sisters of Divine Providence (Sisters) also requested that the alignment be moved 400' further north away from Muddy Pond, than Alternative 4-M-1, to protect their girls camp, at Camp Mishannock, from visual and noise impacts. (See FIGURES 5-3-4, 5-3-5 and 5-3-6).

Alternative 4-N would have required the taking of 9 homes and 3 businesses, affected 35 acres of wetland (23 of which are cranberry bogs) and would not have served the Plymouth Industrial Park. One of the objectives of the project was to provide access to the three industrial parks in the area. Alternative 4-N therefore does not satisfy that objective. If Alternative 4-N was moved further north to avoid the Kingston State Forest, even more wetlands would have to be taken. Also, the alignment would then be approximately 500' from Indian Pond. Based upon the above stated reasons, plus others as discussed in the Alternatives Section, it was determined that Alternative 4-N was not a prudent Alternative.

To avoid the Kingston State Forest by moving the alignment southerly, Alternatives 4-L; Partial Build: Corridors 3-E and 3-W; Upgrade Existing Route and the No Build were studied. Alternative 4-L would have affected Parting Ways Cemetery, a historic property on the National Register of Historic Places. Partial Build Alternative: Corridor 3-W would have affected Cole's Mill, a site of historical significance and potentially eligible for the National Register of Historic Places. See FIGURE 5-3-13. Corridor 3-W would also have affected 30 acres of wetlands, and a portion of Doten Brook would have had to be relocated. Corridor 3-E would have affected 4 acres of wetlands and would have been within 1000 feet, up gradient of the Plymouth Town well north of Triangle Pond. Neither Alternative 4-L; Partial Build: Corridors 3-E and 3-W; Upgrade Existing Route or the No Build would have served the Plymouth Industrial Park. One of the objectives of the project was to provide access to the 3 industrial parks in the area and these Alternatives did not satisfy this objective. Based upon the above stated reasons plus others as discussed in the Alternatives Section it was determined that Alternatives 4-L; Partial Build Build: Corridors 3-E and 3-W; Upgrade Existing Route and the No Build were not prudent Alternatives. If Alternative 4-M-1 was moved southerly to avoid the Kingston State Forest, it would have had to cross Muddy Pond. This would have affected the habitat of the White-Bracted Boneset and would have had a greater visual impact and noise impact on Camp Mishannock. This modification is not considered prudent.

CAMP NEKON

Two small remote corners of Camp Nekon will be crossed by Alternative 4-M-5. Neither area is used for active recreational programs. One contains about 5.07 acres, the other about 4.10 acres of which about 3.60 acres are within the proposed right of way and about 0.50 acres will be isolated. See MAP 5-A.

There are no known roadways to be severed by the proposed highway that would prevent Kingston Police or the Kingston Fire Department from responding to an emergency in the southern areas of Camp Nekon. The area of Kingston south of the proposed highway can be reached via new Route 44 to the Connector Road to Route 80. Route 80 is the only connection between north and south Kingston at the present time, and the new highway does not change that situation. Also mutual aid assistance from Plymouth is available.

Both Alternatives 4-M and 4-M-1 would have required a taking of 4.6 acres of Camp Nekon land. At the request of the Department of Environmental Management (DEM) to move the alignment further north away from the shores of Muddy Pond, to avoid conflict with one of the state's rarest and most endangered plant species, the White-Bracted Boneset (see FIGURE 5-3-3), Alternative 4-M was further modified into the final alignment called 4-M-5. This modification of the alignment away from Muddy Pond caused the further incursion into Camp Nekon requiring the taking of 2 parcels of land, one containing 5.07 acres and the other containing 4.10 acres. The Sisters of Divine Providence also requested that the 4-M alignment be moved 400 feet further north away from Alternative 4-M and away from Muddy Pond to protect their girls' camp at Camp Mishannock from Visual and Noise Impacts. See FIGURES 5-3-4. 5-3-5, and 5-3-6.

The areas of land to be taken from Camp Nekon are from two isolated wooded areas far removed from the recreation areas. The taking of land for the highway and the replacement of acreage to Camp Nekon will rearrange the configuration of Camp Nekon but the net effect will be positive as 19.65 acres will replace the 8.67 acres taken plus the 0.5 acres isolated for a net increase of 10.48 acres to Camp Nekon.

For the discussion on moving the alignment either northerly, southerly, or No Build to avoid the use of Camp Nekon land see the discussion above on Kingston State Forest. The Alternatives which best minimized harm to Section 4(f) properties are Alternatives 3-E/3-W, No-Build, Upgrade Existing Route and 4-L. These Alternatives would have required no land from Camp Nekon or the Kingston State Forest. However, as discussed above, these Alternatives have been determined to be not prudent.

5. MEASURES TO MINIMIZE HARM

KINGSTON STATE FOREST

Many meetings have been held between the Department of Public Works (DPW) and the Department of Environmental Management (DEM) to negotiate equitable compensation for the land to be taken from Kingston State Forest for the proposed Route 44. See FIGURES 5-3-7, 5-3-8, and 5-3-9. The 19.62 acre parcel of privately owned land that will become isolated will be transferred to DEM as partial replacement land payment. DEM feels strongly that there should be additional replacement lands at some other location other than to the Kingston State Forest. See FIGURE 5-3-7.

DEM has submitted to the DPW a listing of 4 privately owned land parcels that they would consider for additional replacement lands either in total or in any combination. Parcel #1 contains 17.25 acres. Title to this parcel is claimed by a private party, that pays the yearly property tax, and Myles Standish State Forest (MSSF), that is under the control of DEM. It is DEM's purpose to obtain a clear title to this property and add it to MSSF. Parcel #2 contains 133.53 acres, Parcel #3 contains 15.53 acres and Parcel #4 contains 43.0 acres. Parcels #2, #3, and #4 are all owned by the same person and are tax title property. The purchase and transfer, by the DPW to DEM, of Parcels #1, #3 and #4 containing 75.78 acres combined approximates the 74.46 acres to be taken or isolated from Kingston State Forest. This mitigation measure is contingent upon the parcels of land being available during the design phase, when the right of way acquisitions will take place. If the referenced parcels are not available at the time of right of way acquisition, the DPW will negotiate with DEM for other replacement lands to the mutual satisfaction of both Departments. Existing statutes do not allow for compensation to be placed in an escrow account by DPW for future use by DEM.

Notwithstanding the ultimate resolution of a land transfer agreement between the responsible State agencies, FHWA will apply normal procedures pertinent to the acquisition of real property to determine compensation requirements for lands to be acquired from the State Forest.

CAMP NEKON

At various meetings and in letters Kingston town officials stated that they would not oppose the taking of 2 parcels of Camp Nekon land totaling 9.17 acres, provided that they receive functional replacement lands. See FIGURES 5-3-10 and 5-3-11. Although no formal negotiations have been held between the DPW and Kingston, the DPW proposes to transfer the remaining 19.65 acres of private land to Camp Nekon as functional replacement land. See MAP 5-A. The DPW is to acquire 3.45 acres of the 23.10 acre parcel for the highway leaving 19.65 acres isolated. This proposal is contingent upon this parcel being available during the design phase, when the right of way acquisitions will take place. The Department of Public Works is committed to the functional replacement of Section 4(f) lands to the Kingston State Forest and to Camp Nekon as explained in the Measures to Minimize Harm section. See FIGURE 5-3-12.

Disturbed Section 4(f) land areas will be regraded, stabilized, loamed and seeded as part of the construction contract. A separate landscaping contract will follow the construction contract. DEM will be invited to participate in the final landscaping contract.

6. COORDINATION

The United States Department of Interior (DOI), Washington, D.C. office commented on the Draft EIS on July 6, 1979. DOI's comments were primarily with the impacts to the Section 4(f) lands and wetlands.

All of DOI's comments on the Draft EIS have been responded to and appear in Section 7.

The Town of Kingston submitted a letter to the Department of Public Works dated August 25, 1978 (FIGURE 5-3-14) giving the pertinent information on Camp Nekon, Section 4(f) land.

The Town of Kingston reviewed the Draft Environmental Impact Statement, which included the Draft 4(f) Evaluation. They submitted comments in a letter dated June 12, 1979 (FIGURE 5-3-15). This letter is also included in Section 8, along with DPW's response.

7. CONCLUSION

Based upon the above considerations, it is determined that there is no feasible and prudent alternative to the use of land from the Kingston State Forest and Camp Nekon, both in Kingston, and that the proposed action includes all possible planning to minimize harm to Kingston State Forest and Camp Nekon resulting from such use.

RS. 66866

Massachusetts
Natural Heritage
Program

August 4, 1983

Mr. Walter Williams
Project Development
Department of Public Works
100 Nashua St.
Boston, MA 02114

Re: Rt. 44 Alignment, Kingston

Dear Mr. Williams:

We have reviewed the plans for the latest alignment for Rt. 44 in Kingston as prepared by ~~C.E. McGuire~~. So far as we are able to determine, the alignment 4M-5 is satisfactory in regards to its affect on rare species in the Muddy Pond vicinity. Relocating the alignment northward away from the pond has greatly reduced the likelihood of damage to the pondshore environment from runoff, spills, and construction.

We appreciate the opportunity to participate in the planning process and remain at your service. Feel free to contact us with any questions in the future.

Sincerely,

John E. Feingold

John E. Feingold
Program Coordinator

JEF:phb

FIGURE 5-3-1

Department of Environmental Management 100 Cambridge Street, Boston, Mass. 02202 (617) 727-3188

The Commonwealth of Massachusetts

Executive Office of Environmental Affairs

Division of Conservation Services

Leverett Saltonstall Building

100 Cambridge Street, Boston 02202

July 24, 1985

Dr. Michael D. Meyer, Director
Bureau of Transportation
Planning and Development
Department of Public Works
10 Park Plaza
Boston, MA 02116-3878

RE: Route 44-Carver-Plympton, Kingston and Plymouth

Dear Dr. Meyer:

I have reviewed our files for the Land and Water Conservation Fund, the Self-Help Program and the Urban Self-Help program for the above referenced municipalities. Based upon our available records this office has not executed monies on any land included in your proposed highway project.

If you have further questions don't hesitate to contact this office.

Sincerely,

William H. Lesser
Land Use Administrator

WHL/jd

FIGURE 5-3-2

60740

The Commonwealth of Massachusetts

Executive Office of Environmental Affairs

Department of Environmental Management

Leverett Saltonstall Building, Government Center

100 Cambridge Street, Boston 02202

IAM F. M. HICKS
OMMISSIONER

RECEIVED
NOV 12 1981
CHIEF ENGINEER

October 28, 1981

Justin L. Radlow
Chief Engineer
Department of Public Works
100 Nashua St.
Boston, MA 02114

Re: Proposed Route 44 relocation, Kingston, MA.

Dear Mr. Radlow:

I am writing as a result of a recent meeting between Massachusetts Natural Heritage Program (MNHP) staff and Department of Public Works personnel to discuss the proposed rerouting of Route 44, in Kingston. On September 11, 1981 John Feingold, Program Coordinator of MNHP, met with DPW's Rt. 44 project manager Gregory Prendergast to brief him on potential rare species conflicts in the Muddy Pond area. These conflicts had previously been discussed with Mr. Hartley, Mr. Prendergasts's predecessor. After a review of its ongoing inventory of the state's rarest and most endangered species and ecological features, MNHP has identified Muddy Pond as one of ten ecological sites in Massachusetts deserving highest priority for protection. On the basis of this designation, The Nature Conservancy, a national land conservation organization, is studying Muddy Pond to develop an appropriate preservation strategy. Eve Endicott, Director of the Conservancy's New England Field Office, was also present at the meeting.

As you may know, the preferred alignment for Route 44, "4-M," may have adverse impacts on the world's largest population of Eupatorium leucolepis var. novae-angliae (White-Bracted Boneset.) This rare plant's range is restricted to a few sites in Rhode Island and southeastern Massachusetts, with about 60% of its known global population located along the eastern shores of Muddy Pond. E. leucolepis var. novae-angliae was cited in the December 15, 1980 Federal Register as a taxon with first priority for proposed federal listing under the Endangered Species Act of 1973. DPW and MNHP staff have been working together since December, 1980 to try to incorporate this rare species' protection into the planning for Rt. 44.

The 4-M alignment as shown in the Draft Environmental Impact Report was field-checked by MNHP staff on March 26, 1981, raising several concerns. First, the proposed route would go through, or very close to, a pondlet just northeast of Muddy Pond. This pondlet appears to have direct groundwater connection with Muddy Pond, and is also one of two local sites for Psilocarya scirpoides, a rare species of Bald Rush. Secondly, the topography along 4-M may provide visual access to the pond shores where E. leucolepis grows. Thirdly, the topography would direct drainage from the proposed highway site towards Muddy Pond.

FIGURE 5-3-3

At the recent meeting with Mr. Prendergast, several specific recommendations [redacted] loweolenis and P. scirpoides were discussed. These included: 1) To prevent groundwater contamination impacts - The 4-M alignment should be moved farther north into the State Forest lands to avoi theadjacent pondlet entirely, if possible. Careful study of groundwater movement in the area should be made to ascertain the effects on Muddy Pond of disturbance of the adjacent pondlet. 2) To prevent surface-runoff contamination impacts - [redacted] Closed drainage should be provided along the section of highway north of Muddy Pond and the pondlet, to contain traffic wastes, road salt, and stormwater runoff. 3) To minimize physical and visual access - Vegetative screening should be maintained thus discouraging passers-by from increasing the use of the site. These concerns should be reflected in the scope and recommendations of the Final Environmental Impact Report. The Natural Heritage Program would be pleased to meet with you or your staff to discuss the recommendations for the protection of the rare species in further detail.

The development of regular coordination of MNHP with the DPW planning process was also discussed at the September 11 meeting. Early access to the Heritage Program data base, which is the only current and increasing statewide inventory of rare plants, animals, and significant ecological features, could be valuable to highwayplanners and ultimately yield substantial savings in staff time and money. The Program presently has over 2500 rare element occurrences mapped and cross-referenced in computer and manual files, the computer portion of which DPW has maintained until recently. Copies of this letter are being sent to MEPA, the Division of Forests and Parks, and the Federal Highway Administration with a request for MNHP to be included on appropriate "early coordination" mailing lists.

The Department of Environmental Management and DPW have been cooperating throu out the planning process to determine equitable compensation for DEM lands. In a letter on May 7, 1980 to DPW, former Commissioner Richard Kendall described the potential net acreage loss to Kingston State Forest from the proposed rerouting of Route 44. Please note that DEM's willingness to consider an incursion into the State Forest will be contingent upon protection of Muddy Pond and its rare species populations. Based on these considerations, we will be prepared at some future appropriate time to enter into an agreement with your Department concerning the compensating lands which will be added to the state forest and park systems as a result of the relocation of Rt. 44.

We appreciate the opportunity to be of service in this planning process and hope such cooperation will continue in the future. Please do not hesitate to call us if you have any questions.

Yours Sincerely,

William F M Hicks

William F. M. Hicks
Commissioner, DEM

cc: Sam Mygatt, MEPA Unit
Gilbert Bliss, Division of Forests and Parks
Norman Van Ness, Federal Highway Administration
Frank Bracaglia, Staff Specialist for Environment, FHWA
William Ashe, U.S. Fish and Wildlife Service

WFH/ASF/asf

RS 55410

Sisters of Divine Providence
Provincial House
Box 2, Route 80
Kingston, Massachusetts 02364

Telephone 746-3045

December 6, 1980

Mr. Justin Radlo
Department of Public Works
100 Nashua St.
Boston, Massachusetts 02114

Dear Mr. Radlo:

Mr. Frazer-Hartley has informed us of the change in the location of that portion of Route 44, 4MM alignment, which enters our property.

We are grateful that the change in the design will relocate the road an additional 400 feet further away from Muddy Pond. The water level of the ponds at Camp Mishannock is crucial to our operation of the camp, as well as to the water supply for personnel, students and faculty.

We find no difficulty in participating in negotiations which will allocate the segmented portions of our property (as indicated in the latest re-alignment) to Camp Nekon.

Thank you for your consideration.

Sincerely yours,

S. Dolores

Sister Dolores Kohout
(For the Community Board)

Copy to Office of Selectmen, Town of Kingston

CHIEF ENGINEER
RECEIVED
DEC 10 1980

FIGURE 5-3-4

Sisters of Divine Providence
Provincial House
Box 2, Route 80
Kingston, Massachusetts 02364

Jaunary 18, 1981

Telephone 746-3045

Mr. Justin Radlo
Department of Public Works
100 Nashua St.
Boston, Massachusetts 02114

ret llip 5-5410

Dear Mr. Radlo,

In the letter Sister Dolores wrote on December 6, 1980 and the letter I wrote on January 7, 1981, there was some confusion as to the reply we were seeking. Let me summarize the situation and try to state my question succinctly.

In November, 1980, in a verbal discussion with Mr. Frazer-Hartley a request for a change in the proposed 4M alignment of Route 44 was made. This alignment was designated as 4MM in our discussion. The change in the design would relocate the road an additional 400 feet away from Muddy Pond. The water level of the ponds at Camp Mishannock is crucial to our operation of the camp, as well as to the water supply for our personnel, students and faculty.

We would find no difficulty in participating in negotiations which will allocate the segmented portions of our property (as indicated in the latest realignment) to Camp Nekon.

Does it seem feasible that the 4MM realignment will be incorporated into the final plan and will it become part of the environmental impact study? Does the State Department plan to effect the negotiations discussed for the 4MM design?

Your attention to this matter is deeply appreciated.

Sincerely yours,

CHIEF ENGINEER
RECEIVED
JAN 20 1981

Sister Ida Mary Lutz

Sister Ida Mary Lutz
(For the Community Board)

Copy to Office of Selectment, Town of Kingston

FIGURE 5-3

R.S.$ 56077

Ltrs. sent
1-28-81

January 23, 1981

Route 44 Relocation
Kingston

Sisters of Divine Providence
Sister Ida Mary Lutz (Provincial)
Provincial House
Box 2, Route 80
Kingston, Massachusetts 02364

Dear Sister Ida Mary Lutz:

This is in reply to your letter dated January 18, 1981 requesting that the proposed Route 44 alignment be moved 400 feet further away from Muddy Pond and Camp Mishannock in Kingston. I understand that both you and the Town of Kingston have met, are in agreement with the requested change and are willing to enter into future negotiations during the Route 44 Right of Way Acquisition Stage.

Your request appears reasonable but any taking of Camp Nekon/or highway purposes will involve additional Section 4(f) Properties. However, our Department is glad to respond and by a copy of this letter I am directing our Study Consultant, the Architects Collaborative (T.A.C.) to review this proposed change and to make sure of its feasibility. Upon receiving a favorable report from our Consultant, Commissioner Amidon will be briefed on their review and I will notify you of his decision.

Please contact my office if you have any questions on this project.

Very truly yours,

JUSTIN L. RADLO
CHIEF ENGINEER

FH/emf
CC: T.A.C.
Dist. #7
Kingston Selectmen

FIGURE 5-3-6

RICHARD E. KENDALL
COMMISSIONER

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Management
Leverett Saltonstall Building, Government Center
100 Cambridge Street, Boston 02202

May 7, 1980

Mr. Dean Amidon, Commissioner
Department of Public Works
100 Nashua Street
Boston, Massachusetts

Dear Commissioner Amidon:

The Department of Environmental Management has reviewed the situation relative to the placement of a proposed new Route #44, and its impact on the Kingston State Forest.

The summary of facts appears to be as follows:

The highway routing, which seems to be the only reasonable course of action should a new highway be built, would utilize 25.8 acres of the state forest and isolate an additional 57.5 acres. It would seem likely that 17.4 acres of private land adjacent to what will be the only remaining large block of state forest land could be transferred to this agency resulting in a net loss in acreage of 65.9 acres.

It does not seem likely that replacement of any large acreage at this location would be of any significant benefit to improving the values that would be lost, although we would entertain the consolidation within the remaining state forest of the 17.4 acre private tract which presently belongs to the Sisters of Divine Providence.

It is my feeling, however, that the replacement of acreage to the state forest and park system in southeastern Massachusetts should be done at some location other than Kingston in the approximate amount of 65 or 70 acres, or their equivalent in value.

The Department of Environmental Management could support the placement of the highway with the understanding that additional acreage would be acquired by D.P.W. to compensate for the losses incurred at Kingston. It would appear that the impact of this highway would reduce by about 50% the open space and natural resource benefits that this land currently is providing. We can only support the proposed highway action if an additional compensating lands are returned to the state forest and park system at some regional location that we may mutually agree upon.

OFFICE OF THE
COMMISSIONER
'80 MAY 14 AM 9 22
D.P.W.
RECEIVED

Sincerely,

Richard E. Kendall

Richard E. Kendall
Commissioner

REK:GAB.mk

FIGURE 5-3-7

F.H.
R.S.#C-15612
Stev. sent
8-1-80

July 23, 1980

U. S. Route 44 Reolcation
Kingston

Mr. Richard Kendall, Commissioner
Department of Environmental Management
100 Cambridge Street
Boston, Massachusetts 02202

Dear Commissioner Kendall:

Thank you for your letter dated May 7, 1980 acknowledging the proposed routing of U. S. Route 44 through the Kingston State Forest and suggesting that a replacement of acreage (land swap) or equivalent at some regional location other than Kingston may be mutually acceptable.

At a follow-up meeting on July 1, 1980 with Mr. Russell Weeks of your Forest and Parks Southeastern Region, our Department received information on 48 acres of privately owned land in Plymouth that met your basic land swap conditions. This land is presently scheduled for investigation by our Right of Way Bureau.

As soon as we show progress on this proposed land swap, we plan to meet again with your Forest and Parks representative.

Should you have any questions, please contact John F. Hurley, Environmental Engineer or his designee, Frazer Hartley at #727-8186.

Very truly yours,

DEAN P. AMIDON
COMMISSIONER

FH/emf
CC: Dist.#7
Gilbert Bliss
J. Finale
T.A.C.

FIGURE 5-3-8

W. William
hand delivered 7/5/?

Jun 27, 1984

James Gutensohn, Commissioner
Department of Environmental Management
Leverett Saltonstall Building
100 Cambridge Street
Boston, Mass.

Attention: Gil Bliss, Director Forest and Parks

Dear Commissioner Gutensohn:

A meeting was held on February 15, 1984 with G. Bliss and D. Boogdarian of Department of Environmental Management (DEM), to review land taking from Kingston State Forest required for the proposed Route 44 highway project in Carver, Kingston and Plymouth.

The attached plan shows the location of the proposed highway and its effect upon the forest land. The Right of Way required for the highway equals approximately 26 acres. Forest parcels "A" "B" and "C", as shown on attached plan, containing approximately 57 acres will become isolated and it is my understanding that DEM is not interested in maintaining or retaining title to them. If the owners of Parcels "D" & "E" containing approximately 6 and 17 acres respectively do not desire to retain ownership the Department could transfer these two parcels to DEM as partial functional replacement land for the 83 acres of forest affected by the DPW. The negotiations for the transfer of parcels "D" & "E" to DEM plus the remaining functional replacement land cannot take place until the Design Phase of this project, probably 1½ to 2 years hence, but they will be carried out to the mutual satisfaction of both parties.

We are encroaching into the Kingston State Forest in response to DEM request, letter dated October 28, 1981 to Chief Engineer J.L. Radlo from W. Hicks, Commissioner DEM to move the alignment northerly away from Muddy Pond to protect the White Bracted Boneset. A closed drainage system is being designed for this area to protect this endangered plant, as per your request.

Richard Kendall, Commissioner DEM in a letter dated May 7, 1980 to DPW Commissioner Dean Amidon stated that "The DEM could support the placement of the highway with the understanding that additional acreage would be acquired

FIGURE 5-3-

Commissioner Gutensohn

by DPW to compensate for the losses incurred at Kingston". I can assure you that the DPW is committed to negotiating with DEM to the mutual satisfaction of both parties to functionally replace the forest land lost to DEM by our proposed highway. I request that you concur in writing with our proposal to negotiate for functional replacement lands. This letter is required to comply with Section 102(2)(c) of the National Environmental Policy Act of 1969 and Section 4(f) of the Department of Transportation Act of 1966 to show that consultation with officials having jurisdiction of the affected lands has been held.

Your Draft of proposed legislation, establishing a fund to be the repository for the value of state forest land taken for highway purposes is being reviewed by Department personnel. We support the basic concept of such legislation and would like to meet with you to incorporate some proposed additions to the bill. Please contact David Reilly at 973-7833 at your convenience to establish a meeting date.

If you have any other questions concerning the Route 44 project please call Walter Williams, the project expediter at 973-7495.

Very truly yours,

ROBERT T. TIERNEY
COMMISSIONER

WW/is

Encl.

RS 55340

TOWN OF KINGSTON, MASSACHUSETTS

Office of

THE SELECTMEN

TELEPHONE 585-4445

REGULAR MEETINGS

TUESDAY 7:15 P.M.

December 4, 1980

Mr. Justin Radlo, Chief Engineer
The Commonwealth of Massachusetts
Department of Public Works
100 Nashua Street
Boston, MA 02114

Dear Mr. Radlo:

The Board of Selectmen, although not rescinding its objection to having Route 44 constructed through Kingston, will not oppose negotiating with the Congregation of Sisters of Divine Providence on their proposal for a realignment of a portion of the 4MM proposal for Route 44.

Sincerely yours,

William B. Martin

William B. Martin
Chairman

M/p
cc Sister Dolores Kohout

CHIEF ENGINEER
RECEIVED
DEC 8 1980

FIGURE 5-3-10

TOWN OF KINGSTON, MASSACHUSETTS

Office of

THE SELECTMEN

TELEPHONE 585-4445

September 13, 1984

Robert McDonaugh, Chief Engineer
Massachusetts Department of Public Works
100 Nashua Street
Boston, Massachusetts 02114

Re: Route 44

Dear Mr. McDonaugh:

In regard to the taking of land in Kingston for the construction of Route 44, it is our understanding that negotiations will be established and various options may be available to the Town.

Generally, the Board is in agreement with this procedure and the functional replacement concept.

If we may be of any further assistance, please let us know.

Sincerely,

Thomas D. Lawton

Thomas D. Lawton
Chairman

H/p

FIGURE 5-3-11

November 5, 1980

Re: Route 44 Relocation
Kingston

Mr. Richard E. Kendall, Commissioner
Department of Environmental Management
100 Cambridge Street
Boston, Mass. 02202

Dear Commissioner Kendall:

This is reference to the proposed Route 44 Relocation in Kingston. The alignment recommended for the Final Environmental Impact Statement (FEIS) would as you have stated in your May 7, 1980 letter utilize 25.8 acres of the Kingston State Forest and isolate an additional 57.5 acres.

Federal Highway Right of Way Program Manager R.E. Dutil, Jr. has been contacted and the concept of "functional replacement" for the public land - Kingston State Forest - required for the relocation is eligible for federal participation.

I have directed Mr. John F. Hurley, Environmental Engineer, to arrange a meeting through your office to discuss the compensating lands and particularly the land in Plymouth suggested by Mr. Russell Weeks of your Forest and Parks. The intent of the meeting would be to mutually agree on compensating lands so these lands may be identified in the FEIS.

Very truly yours,

DEAN P. AMIDON
COMMISSIONER

FH/sfp
cc District 7
T.A.C.

Gilbert Bliss

FIGURE 5-3-1

RS # 75845

The Commonwealth of Massachusetts

Office of the Secretary of State
Michael Joseph Connolly, Secretary

Massachusetts Historical Commission
Valerie A. Talmage
Executive Director
State Historic Preservation Officer

March 7, 1986

Mr. Robert J. McDonagh
Chief Engineer
Department of Public Works
Ten Park Plaza
Boston, MA 02116-3973

RE: Evaluation of Cole's Mill Site, Carver

Dear Mr. McDonagh:

Staff of the MHC have reviewed information pertaining to the potential significance of the Cole's Mill site in Carver and its eligibility for nomination to the National Register of Historic Places.

Based on information provided in the 1979 report entitled, "Archaeological Evaluation of Cole's Mill, Carver, Massachusetts," which was prepared by Garth Bawden at the Institute for Conservation Archaeology, the MHC concurs with I.C.A.'s finding that the Cole's Mill site possesses great significance on three levels - archaeological value, history of local industrial development, and evolution of the cultural environment. Furthermore, since the site's building foundations and water channelling abutments were judged by the project archaeologist at the time of the survey to be in an excellent state of preservation and since the site was expected to contain intact deposits associated with the various uses and building stages of the site, the MHC considers the Cole's Mill site to be eligible for nomination to the National Register of Historic places as meeting criteria C and D.

The MHC recognizes that the Cole's Mill site is outside the impact zone of the Route 44 Relocation Project, and concurs with MDPW's finding of "no effect" (36 CFR 800). If you have any questions concerning this review or require further assistance, please contact Jordan Kerber of this office.

Sincerely,

Valerie Talmage

Valerie A. Talmage, Executive Director
State Historic Preservation Officer
Massachusetts Historical Commission

FIGURE 5-3-13

80 Boylston Street, Boston, Massachusetts 02116 (617) 727-8470

VAT/JK/dr

TOWN OF KINGSTON, MASSACHUSETTS

Office of

THE SELECTMEN

TELEPHONE 585-4445

REGULAR MEETINGS

TUESDAY 7:15 P.M.

August 25, 1978

Robert T. Tierney, P.E.
Chief Engineer
Department of Public Works
Commonwealth of Massachusetts
100 Nashua Street
Boston, Massachusetts 02114

Dear Mr. Tierney:

Please be advised that the Board of Selectmen has jurisdiction over the section of Kingston known as Camp NeKon by virtue of townmeeting action.

For the purpose of Section 138, of Title 23, and Section 4f of the 1966 Dot Act, we feel that the area known as Camp NeKon is significant because the area under consideration has been purchased specifically for park, recreation, and conservation purposes as well as for the maintenance of a wildlife preserve. Attached as Appendix A is a map defining the various public uses of Camp NeKon property. We feel, also, that contiguous areas in the southwest part of Kingston, although not town owned, are significant in terms of the Section 4f statement.

Various town agencies have spent many months evaluating the Camp NeKon area and contiguous parcels in view of this statement requirement. Obviously, a proper and complete impact statement cannot be submitted at this time because time restrictions prevent us from doing migratory studies during migratory seasons, etc. We have, however, spent as much time as we could be allowed by your Department to gather as many facts as possible.

Camp NeKon was purchased by the town, solely with town funds, from the Plymouth Bay Girl Scout Council in 1975 for the purpose of implementing the town's master plan as it pertains to land use, maintenance of open spaces, and the protection of natural resources. The philosophy guiding the development of our town's master plan that "recreation and open space should be regarded not as a luxury, but as a necessity...such lands are necessary to preserve the balance of nature...to reserve desirable natural features...to protect essential water resources...." still guides our town's planners and officials.

FIGURE 5-3-14

The Commonwealth has submitted several alternatives for the relocation of Route 44. Not all proposals bisect Camp NeKon: therefore, it appears obvious that the Commonwealth cannot determine, as required under paragraph a of Section 4f, "that there are no feasible and prudent alternatives to the use of land from a publicly owned park, recreation area, or wildlife and waterfowl refuge of national, State or local significance."

The Board fears that the construction of a limited-access highway will slow down the response of fire apparatus responding to possible forest fires in this area. All of the town's firefighting equipment is stationed north of this proposed route. Similarly, police and medical response will have the same slowdown increasing the liklihood of vandalism and serious accidents in this wildlife and recreation area.

The Board fears the construction of this highway along the proposed route will bring ecologic damage along this entire route, thereby further reducing contiguous supporting food areas for wildlife and other ecological features essential to the delicate balance of nature.

Camp NeKon includes Smelt Pond and we have had reported to us the existence in this location of the Purple Gentian, a plant presently on the endangered specie list and of the red-bellied turtle, presently being considered for such listing by the Secretary of the Interior. The Board of Selectmen are on record as supporting the classification of this diminishing specie of reptile as an endangered specie. We have noted the nesting and feeding of many other non-endangered species of song birds and waterfowl at Camp NeKon as well as a profusion of wild plants, many indigenous only to wetland areas and depended upon by certain species of waterfowl.

The Board of Selectmen regard this area as a peripheral watershed area and further note its inclusion on the flood plain maps of the Department of Housing and Development.

All of the concerns entertained and expressed by the town in relation to the Camp NeKon area also apply to those areas of Kingston surrounding and including Muddy, Treacle, and Pratt Ponds. The Board of Water Commissioners have expressed their special concern about any road construction in the area of Treacle Pond where two well sites are proposed.

To avoid redundancy, we have enclosed as appendices statements by the Sisters of Divine Providence who own extensive lands at Muddy Pond as well as by the Town's Conservation Commission and Camp NeKon Committee with which we are in agreement.

The Board of Selectmen urge that a negative determination be rendered for this highly controversial route alternate. The Board of Selectmen reiterates its opposition to any construction of Route 44 through the Town of Kingston because of the foregoing environmental concerns as well as for the reason it promises no economic growth or development of the area. We understand that the road does make such a promise to the Town of Plymouth, of Carver, and of Plympton, and we do not object to their development or growth. We do request, however, that the road be laid out so as to be completely contained within those towns that seek its benefit. Such an alternate has been proposed by the Commonwealth's engineering consultants. Another is marked in blue on our Appendix A.

The Board of Selectmen have attended and conducted several meetings in regards to Route 44 relocation over the past several years. At no meeting was any support voiced for Route 44 coming into Kingston. On the contrary, all elected and appointed officials, interested townspeople and officials of Sacred Heart School voiced their feelings loud and clear - "not in or through Kingston".

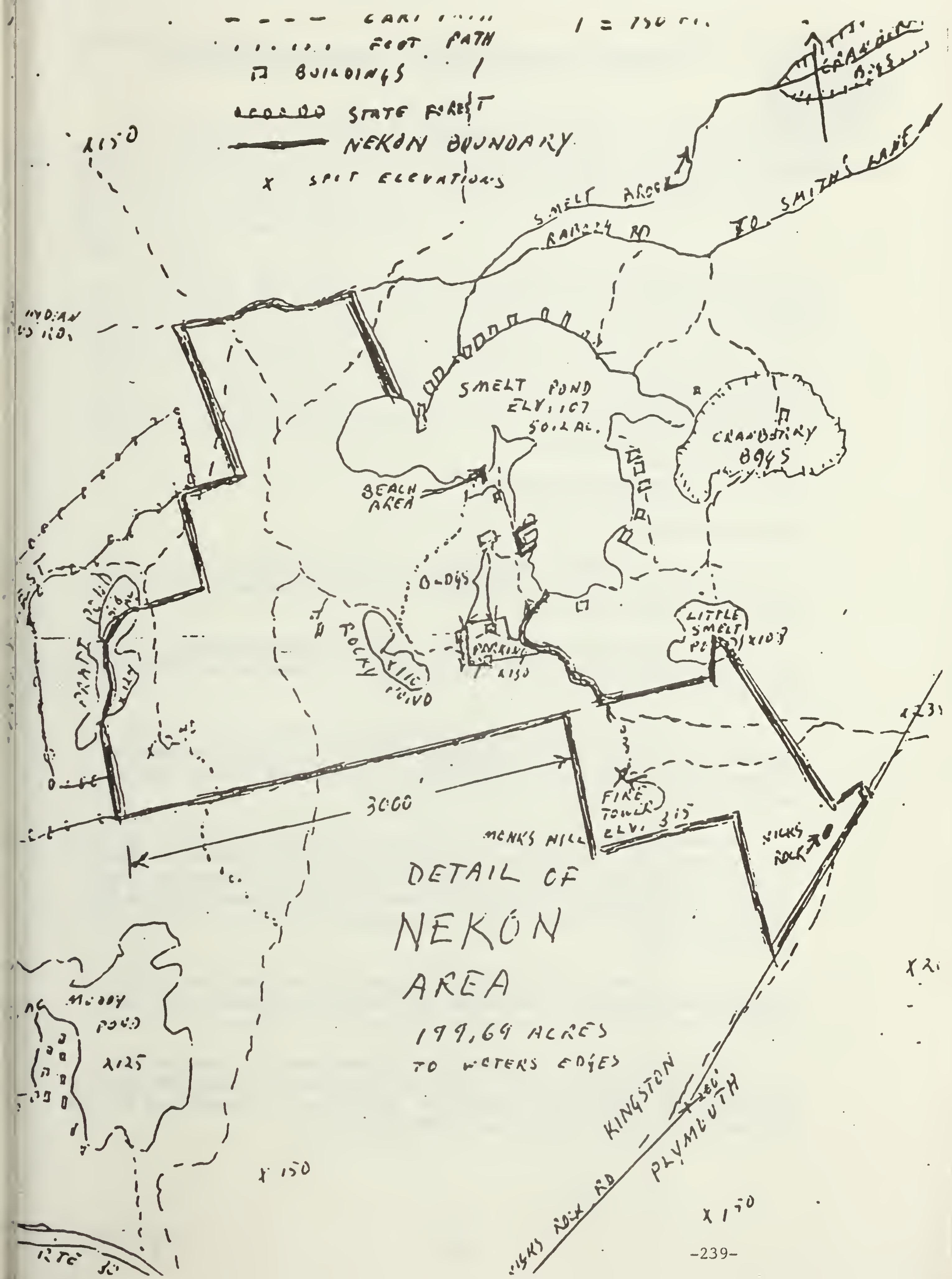
Sincerely yours,

Charles L. Farrington Jr.

Charles L. Farrington, Jr.
Chairman

M/p

Enclosures



FOOT PATH
BUILDINGS
STATE FOREST
NEKON BOUNDARY
SMELT BROOK
SMELT POND
CRANBERRY BOGS
BEACH AREA
LITTLE SMELT POND
PARKING
FIRE TOWER
3000
DETAIL OF
NEKON
AREA
199.69 ACRES
TO WATERS EDGES
KINGSTON
PLYMOUTH

TOWN OF KINGSTON, MASSACHUSETTS

Office of

THE SELECTMEN

TELEPHONE 585-4445

REGULAR MEETI

TUESDAY 7:15 P

June 12, 1979

Justin Radlo, P.E.
Chief Engineer
Department of Public Works
Commonwealth of Massachusetts
100 Nashua Street
Boston, Massachusetts 02114

Dear Mr. Radlo:

The Town of Kingston has formally stated to the MDPW its objection to the relocation of Route 44 through the Town of Kingston. Once again we reiterate that objection.

We are vehemently opposed to the following alternate routes proposed by the MDPW and The Architects Collaborative: Alternate 4-N, Alternate 4-M1; 4-M, and Alternate 4-L.

We are opposed to Alternate 4-N because it bisects the town and threatens our Townspeoples' safety and because it presents a threat to the environmental situation occasioned by its nearness to the Town's landfill operation and water resources.

We are opposed to Alternate 4-M and 4-M1 because it bisects the town and threatens our Townspeoples' safety and because it presents a threat to the environmental situation along the route which includes the State Forest, Camp Mishannock owned and operated by the Sisters of Divine Providence, the town-owned Camp NeKon, and proposed well sites in the area of Treacle Pond.

We are opposed to Alternate 4-L because of its bisection of the Parting Ways Cemetery, a site which the Federal Government has stated shall be preserved as a monument to our national heritage.

For the sake of brevity and to avoid redundancy we refer you to our letter of August 25, 1978, with its enclosures, for more and specific objections to the proposed routes. We beg you not to mistake our brevity for lack of resolve in objecting to these proposals.

FIGURE 5-3-15

We applaud the intention of the MDPW to correct the traffic situation now existing on Route 44 and to develop a coordinated, two-fold program to encourage by this means the economic development of Carver, Plymouth and Plympton. We must now insist, however, as we have requested in the past, that the route be laid out so as to be completely contained within those towns that seek its benefit.

We further insist that an alternate route be found that will avoid the alternatives which are not only of no value but also detrimental to the welfare of the Town of Kingston and its 6,776 residents. Such an alternate has been proposed by the Commonwealth's engineering consultants. Another alternate was proposed by our Town and submitted to you last August. We understand a third alternate, contained completely in Plymouth, was proposed as early as 1975 and is in the files of the Office of State Planning. We urge you to direct your energies more productively by assessing these three proposals and avoiding all others that lie within the Town of Kingston.

Sincerely yours,

Richard A. Ottino

Richard A. Ottino
Chairman

M/p

Enclosures

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
P.O. BOX 1518
CONCORD, NEW HAMPSHIRE 03301

Dr. Michael D. Meyer, Director
Bureau of Transportation
Planning and Development
Department of Public works
Ten Park Plaza
Boston, Massachusetts 02116-3973

FEB 18 1986

Dear Dr. Meyer:

This responds to your January 16, 1986 request for information on the presence of Federally listed and proposed endangered or threatened species within the area of the proposed alignment for Route 44 in Carver, Plympton, Kingston and Plymouth, Massachusetts.

Our review shows that except for occasional transient individuals, no Federally listed or proposed species under our jurisdiction are known to exist in the project area. Therefore, no Biological Assessment or further consultation is required with us under Section 7 of the Endangered Species Act. Should project plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered.

This response relates only to endangered species under our jurisdiction. It does not address other legislation or our concerns under the Fish and Wildlife Coordination Act.

A list of Federally designated endangered and threatened species in Massachusetts is enclosed for your information. Thank you for your cooperation and please contact us if we can be of further assistance.

Sincerely yours,

Gordon E. Beckett

Gordon E. Beckett
Supervisor
New England Area

Enclosure

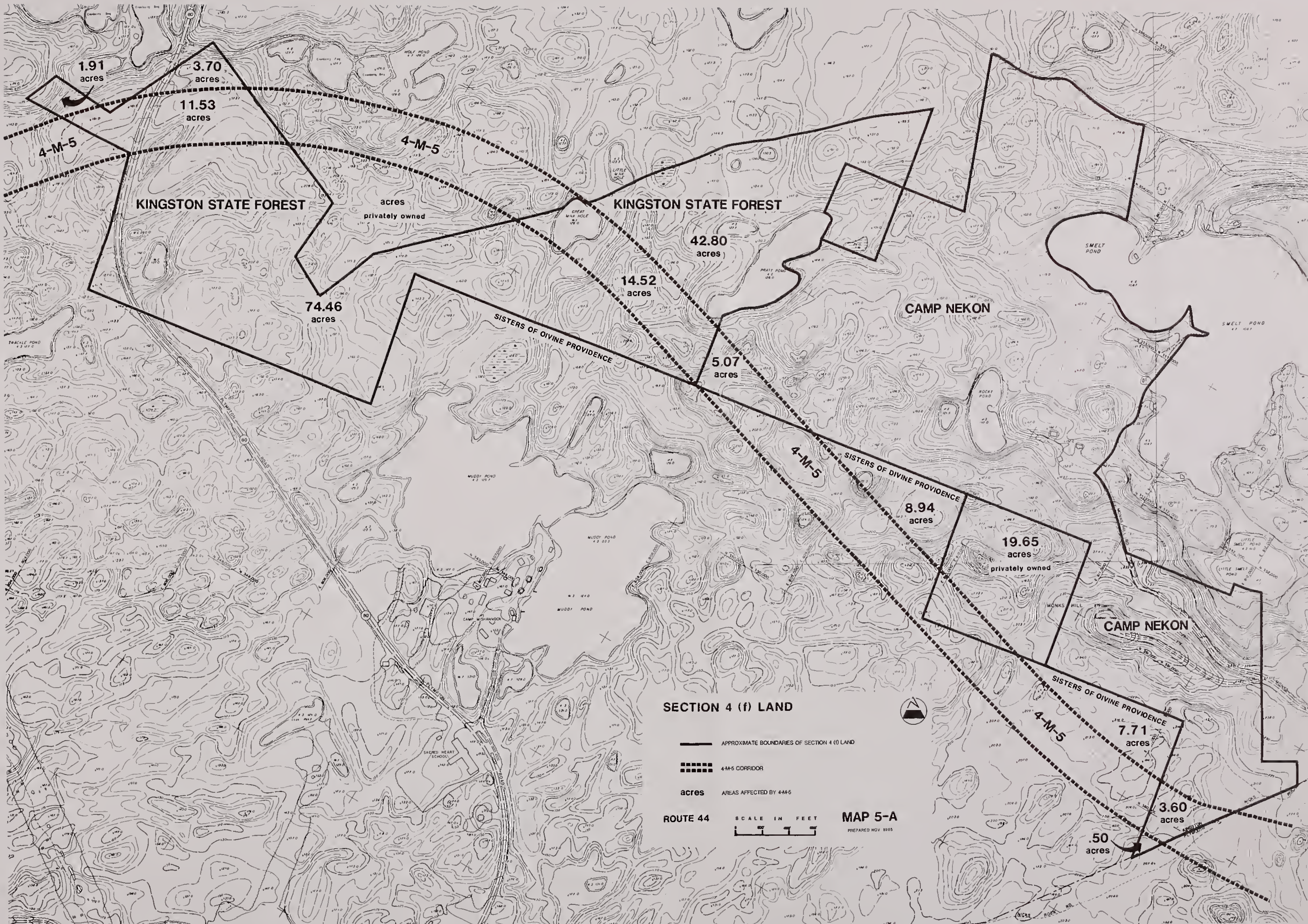
FIGURE 5-3-16

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN MASSACHUSETTS

Common Name	Scientific Name	Status	Distribution
FISHES:			
Sturgeon, shortnose*	Acipenser brevirostrum	E	Connecticut River & Atlantic Coastal Waters
REPTILES:			
Turtle, green*	Chelonia mydas	T	Oceanic straggler in Southern New England
Turtle, hawksbill*	Eretmochelys imbricata	E	Oceanic straggler in Southern New England
Turtle, leatherback*	Dermochelys coriacea	E	Oceanic summer resident
Turtle, loggerhead*	Caretta caretta	T	Oceanic summer resident
Turtle, Atlantic ridley*	Lepidochelys kempii	E	Oceanic summer resident
Turtle, Plymouth red-bellied	Chrysemys rubriventris bangsi	E	Plymouth & Dukes Counties
BIRDS:			
Eagle, bald	Haliaeetus leucocephalus	E	Entire state
Falcon, American peregrine	Falco peregrinus anatum	E	Entire state-reestablishment to former breeding range in progress
Falcon, Arctic peregrine	Falco peregrinus tundrius	E	Entire state migratory-no nesting
Plover, Piping	Charadrius melodus	T	Entire State - nesting habitat
MAMMALS:			
Cougar, eastern	Felis concolor couguar	E	Entire state - may be extinct
Whale, blue*	Balaenoptera musculus	E	Oceanic
Whale, finback*	Balaenoptera physalus	E	Oceanic
Whale, humpback*	Megaptera novaeangliae	E	Oceanic
Whale, right*	Eubalaena spp. (all species)	E	Oceanic
Whale, sei*	Balaenoptera borealis	E	Oceanic
Whale, sperm*	Physeter catodon	E	Oceanic
MOLLUSKS:			
NONE			
PLANTS:			
Small Whorled Pogonia	Isotria medeoloides	E	Hampshire, Essex Counties

* Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service

Rev. 2/11/86


1.91
acres
3.70
acres
11.53
acres
4-M-5
4-M-5
KINGSTON STATE FOREST
acres
privately owned
KINGSTON STATE FOREST
42.80
acres
14.52
acres
74.46
acres
CAMP NEKON
SISTERS OF DIVINE PROVIDENCE
5.07
acres
4-M-5
SISTERS OF DIVINE PROVIDENCE
8.94
acres
19.65
acres
privately owned
CAMP NEKON
SISTERS OF DIVINE PROVIDENCE
4-M-5
7.71
acres
3.60
acres
.50
acres
SECTION 4 (f) LAND
APPROXIMATE BOUNDARIES OF SECTION 4 (f) LAND
4-M-5 CORRIDOR
acres
AREAS AFFECTED BY 4-M-5
ROUTE 44
SCALE IN FEET
MAP 5-A
PREPARED NOV 1985

SECTION 6

LIST OF PREPARERS

FEDERAL HIGHWAY ADMINISTRATION

Arthur Churchill P.E. — District Engineer

Mr. Churchill is a Professional Civil Engineer with more than 28 years of experience with the Federal Highway Administration in Design Engineering and Construction. Mr. Churchill was responsible for the supervision, review and coordination of this FEIS at the Federal level.

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

Frank A. Bracaglia P.E. — Assistant Director of Systems Planning and Development

Mr. Bracaglia is a Professional Civil Engineer with more than ten years of experience with both the Federal Highway Administration and Massachusetts Department of Public Works. He has supervised the preparation of numerous environmental documents at FHWA and MDPW. Mr. Bracaglia was responsible for the supervision, review and coordination of this Final EIS at the state level.

Walter Williams P.E. — Project Manager at Mass. DPW

Mr. Williams holds an Associate Degree in Civil and Structural Engineering. He has worked on numerous environmental documents during the past twelve years in the Systems Planning Section. Mr. Williams was responsible for the review and coordination of this FEIS.

Beatrice Reynolds — Air and Noise Specialist

Ms. Reynolds holds a Bachelor's degree in Civil Engineering and is matriculated in a Master's degree program in Environmental Studies at the University of Lowell. She has been involved with numerous air and noise studies for the Systems Planning Section during the past two years. Ms. Reynolds was responsible for the review and coordination of the Air/Noise sections.

THE ARCHITECTS COLLABORATIVE, INC.

Alex Cvijanovic — Principal-in-Charge

Mr. Cvijanovic is a Vice-President of TAC. He has undergraduate and graduate degrees in Architecture and is registered in Massachusetts. He has been a practicing architect for over 30 years, responsible for many major buildings and community plans throughout the world.

Morton B. Braun Project Manager

Mr. Braun's undergraduate degree was in Government and he has a Master's in City Planning. He has had over 37 years of experience in community and regional planning with local, state and federal agencies as well as in private practice. He has coordinated the impact studies for Route 44 since 1978.

Joanne B. Crowe Planner

Ms. Crowe has undergraduate and graduate degrees in Urban Planning, and has been associated with various planning and research projects for the past 10 years. She was responsible for updating the relocation, demographic and economic data for the Final EIS.

Herbert Kronish Architect

Mr. Kronish has been a practicing architect for over 25 years and is registered in Massachusetts. Mr. Kronish was responsible for updating the maps in the Final EIS, and for assembling the right-of-way data.

CONSULTANTS TO TAC INCLUDED THE FOLLOWING FIRMS AND SPECIALISTS:

L. G. COPLEY ASSOCIATES

Lawrence G. Copley, Ph.D. (Harvard, 1965) B. Mech. Engine. (Univ. of Queensland, Australia, 1960). Registered Professional Engineer (Mass., 1968). Has been a consultant in environmental noise and building acoustics continuously since 1967, including numerous noise impact studies for transportation facilities. Mr. Copley prepared the Noise section.

INSTITUTE FOR CONSERVATION ARCHAEOLOGY, HARVARD UNIVERSITY.

Mr. Russell J. Barber, Ph.D. is Director of the Institute, which is part of the Museum of Archaeology and Ethnology at Harvard University. ICA was responsible for carrying out the archaeological survey investigations required by current federal and state guidelines.

JASON M. CORTELL AND ASSOCIATES, INC.

Mr. Carlton L. Noyes, Vice President, Environmental Sciences, has two degrees in Biology, undergraduate from Bridgeport University, graduate from the University of New Hampshire. Mr. Noyes directs aquatic impact analyses, as well as other water and wastewater related studies, for most of JMCA projects. His training in aquatic biology, water quality analysis, and pollution control techniques provides the basis for the evaluation of potential impacts to the chemical, biological, and physical quality of surface waters. In both his academic and professional careers, he has placed particular emphasis on mathematical ecology, and has extensive knowledge of state-of-the-art methods for quantified field investigation.

Mr. Marshall W. Dennis, Senior Ecologist, has a B.A. in Biology from Clark University, and a Masters in Wildlife Ecology from the University of Rhode Island. Mr. Dennis has had a broad spectrum of academic and professional experience in the botanical and wildlife sciences. His expertise includes the identification, mapping and evaluation of plant communities and wildlife habitats, both wetland and terrestrial.

H. W. LOCHNER, INC.

George Stuopis, P.E., is Vice-President for New England operations. He has a B.S. in Civil Engineering from Illinois Institute of Technology. He has been project manager for numerous highway location and design assignments, and has had over 28 years experience in transportation engineering. Mr. Stuopis was responsible for and directed the preliminary engineering activities required for the FEIS.

Warren Vincent is a Senior Engineer as well as Highway Location and Geometric Design Specialist with H. W. Lochner. He has had over 33 years experience in highway engineering. Mr. Vincent prepared the closed drainage system and other related engineering work for the layout of the proposed highway.

ADDITIONAL CONSULTANTS TO MASS. DEPT. OF PUBLIC WORKS:

H.W. MOORE AND ASSOCIATES

Dr. Franklin G. Ching is Vice President in charge of transportation and environmental analysis. He has served as Principal on a number of environmental impact reports. Dr. Ching has received his B.S.; M.S.; and Ph.D. in Civil Engineering at Mass. Institute of Technology. Mr. Ching was responsible for Air Quality.

DAVID A. ERNST

David A. Ernst has worked for Mass. Division of Air Quality Control as an environmental planner as well as for private consultants reviewing various federal and state environmental impact reports. Mr. Ernst is a graduate of Brown University and holds a Master's degree in City and Regional Planning from Harvard University. Mr. Ernst was responsible for the Air modeling.

SECTION 7

AGENCIES AND ORGANIZATIONS TO WHOM COPIES OF THE FINAL EIS WILL BE SENT

FEDERAL

Advisory Council on Historic Preservation
Department of Agriculture
Department of the Army, Corps of Engineers
Department of Commerce
- National Oceanic and Atmospheric Administration
- National Marine Fisheries Service

Department of Housing and Urban Development
Department of Interior
- Fish and Wildlife Service
- National Park Service

Environmental Protection Agency
Federal Emergency Management Agency

STATE

Department of Commerce and Development
Department of Communities and Development
Department of Public Utilities
Executive Office for Administration and Finance
Executive Office for Communities and Development
Executive Office for Consumer Affairs
Executive Office for Environmental Affairs
- Department of Fisheries Wildlife and Recreational Vehicles
  - Division of Fisheries and Wildlife
- Department of Environmental Quality Engineering
- Department of Environmental Management
  - Division of Forest and Parks
  - Division of Water Resources
  - Division of Waterways
- Department of Food and Agriculture
- Environmental Impact Review (MEPA Unit)

Executive Office for Transportation and Construction
Governor's Advisory Committee on Transportation
Governor's Office
Joint Legislative Committee on Transportation
Massachusetts Historical Commission
Civil Defense Agency
State Clearinghouse

ELECTED OFFICIALS

U.S. Senator Edward M. Kennedy
U.S. Senator John Kerry
U.S. Representative Gerry E. Studds

State Senator Edward Kirby
State Representative Peter Forman

REGIONAL AGENCIES

Plymouth County Commissioners
Southeastern Regional Planning and Economic Development District
Old Colony Planning Council

TOWN OF CARVER

Board of Selectmen
Planning Board
Library
Board of Public Works
Conservation Commission
Development and Industrial Commission
Historical Commission

TOWN OF KINGSTON

Board of Selectmen
Library
Planning Board
Park Commission
Camp Nekon Committee
Industrial Commission
Conservation Commission
Historical Commission

TOWN OF PLYMOUTH

Board of Selectmen and Executive Secretary
Planning Board
Department of Public Works
Development and Industrial Commission
Industrial Development Financing Authority
Permanent Land Use Study Committee
Library
Historic Commission
Conservation Commission
Cemetery Commissioners

TOWN OF PLYMPTON

Board of Selectmen
Planning Board and Industrial Commission
Library
Conservation Commission
Historical Commission

PRIVATE GROUPS

Plymouth Chamber of Commerce
Plymouth County Development Council
Ocean Spray Cranberries, Inc.
Parting Ways: The Museum of Afro-American Ethno-History
Sisters of Divine Providence
Route 44 Task Force

SECTION 8

COMMENTS AND COORDINATION

1. PUBLIC INFORMATIONAL MEETINGS

Public meetings on this project were held on the following dates:

February 24, 1977	in Plymouth
April 14, 1977	in Kingston
May 25, 1977	in Carver
June 29, 1977	in Plymouth
January 26, 1978	in Plymouth
June 22, 1978	in Plymouth
June 6, 1979	in Plymouth (Public Hearing on Draft EIS)

2. COORDINATION WITH FEDERAL, STATE AND LOCAL AGENCIES

May 26, 1981	Department of Public Works (DPW) - Kingston Selectmen and Sisters of Divine Providence (Sisters) met, at the Sisters request to discuss moving the alignment away from Muddy Pond. As requested the alignment was moved 400 feet northerly away from Muddy Pond.
April 3, 1984	DPW met with the Environmental Protection Agency (EPA); Fish and Wildlife (F & W) and Department of Environmental Quality Engineering (DEQE) to review DPW's proposed closed drainage system. All were pleased with the proposal especially the protection that will be given to the Plymouth Aquifer and wetlands from roadway runoff pollutants.
April 24, 1984	DPW met with Carver, Kingston and Plymouth Selectmen, three separate meetings, to review DPW's proposed closed drainage system. All were pleased with the proposal especially the protection that will be given to the Plymouth Aquifer and wetlands from roadway runoff pollutants.
April 30, 1984	DPW met with Plympton Selectmen to review DPW's proposed closed drainage system. They were pleased with the protection to the wetlands.
July 5, 1984	DPW met with Carver Conservation Commission to review DPW's proposed closed drainage system. They were pleased with the protection to the cranberry bogs and wetlands.

July 16, 1984	DPW met with Plymouth Conservation Commission to review DPW's proposed closed drainage system. They were pleased with the protection to the wetlands.
July 19, 1984	DPW met with Kingston Conservation Commission to review DPW's proposed closed drainage system. They were pleased that the closed drainage system will protect existing and proposed wells.
August 6, 1984	DPW met with Plympton Conservation Commission to review DPW's proposed closed drainage system. They were pleased with the protection to the wetlands.
November 16, 1984	DPW met with Executive Office of Environmental Affairs (EOEA) to review DPW's proposed responses to EOEA's Draft EIS comments. Their primary concern was with the wetland impacts, wetland replacement, reducing the width of the median and compliance with wetland regulations.
December 6, 1984	DPW met with EOEA, DEQE and Division of Food and Agriculture (F&A) to review Wetland Regulations, and project wetland impacts. They were pleased with the closed drainage system for the entire project. They were assured that all wetland regulations will be satisfied. Food and Agriculture would like to reduce the impact to cranberry bogs.
December 21, 1984	DPW met with EOEA, Division of Food and Agriculture and DEQE to review DPW's proposed responses to EOEA's Draft EIS comments. Reviewed Farmland Conversion Impact and Rating Form with Food and Agriculture. EOEA again requested that consideration be given to reducing the width of the median, especially in wetland areas. DPW agreed to review this issue.
January 9, 1985	DPW met at Lakeville field office with DEQE and F & A to review the proposed project and the wetland impacts. DEQE was concerned with the water supply to wetlands that are divided by the area. They were also concerned that there will be no threat of flooding from water released from the retention ponds. DPW assured DEQE that culverts will be installed if required to assure water supply to the wetlands, and that the water released from the retention basins will be controlled so that there will be no threat of flooding.
January 29, 1985	DPW met with EPA, Department of Interior (DOI) Boston office, F & W to review DPW's proposed responses to their Draft EIS comments. U.S. Corps of Engineers was invited but could not attend. A copy of the meeting memo was sent to their office. See attached memorandum of meeting, FIGURE 8-2-1.

June 25, 1985	DPW met with EPA to review DPW's proposed responses to EPA's concerns raised at 1/29/85. U.S. Corps of Engineers was invited but could not attend. Reviewed in great length the reasons why Great Mink Hole could not be avoided, as well as the proposed location for the wetland replacement areas. The DPW, after an in-depth review, reduced the width of the median from 100 feet to 60 feet.
July 11, 1985	DPW met with F & W to review DPW's proposed responses to F & W's concerns raised at 1/29/85 meeting. DPW briefed F&W on their proposals as presented to EPA on 6/25/85. See meeting note above for 6/25/85.

In April 1983 a Route 44 Task Force was formed by business and civic leaders in the project area to encourage the prompt completion of Route 44. Monthly meetings were held through April 1984 with DPW providing project status reports. Two meetings have been held since April 1984, one on September 10, 1984 and one on February 27, 1985.

3. SUMMARY OF PUBLIC HEARING

On June 6, 1979 a corridor public hearing was held at the West Elementary School, Plymouth to record testimony on the Draft EIS. Plans showing the first seven Alternatives (Alternative 4-M-5 was developed subsequently) were on display and each was described for the audience. Public officials who stressed the need to relocate Route 44 and urged that those opposed should work with the Mass. DPW to develop an acceptable Alternative included, among others: State Representative Alfred Almeida, State Senator Robert McCarthy, Plymouth Selectmen Ken Tavares, Roger Silva, Joseph Gallitano and Clarence Kreuger, and Carver Selectman Frank Masile. Plymouth, Carver, and Plympton Town officials stated their preference for Alternative 4-L because it was entirely outside of Kingston, but Plymouth officials were opposed to Alternative 4-L because of its impacts on neighborhoods and on Parting Ways Cemetery. The Sisters of Divine Providence expressed disfavor with Alternative 4-M and 4-M-1 because of their impacts on Camp Mishannock, Muddy Pond and their schools. The Southeastern Massachusetts Regional Planning and Economic Development District favored Alternative 4-M-1. The Old Colony Planning Council stated its opposition to Alternative 4-L, but favored a relocation of Route 44. Boston Edison Company indicated that Alternative 4-N would have the least impact on its long distance transmission lines, and Alternative 4-L the most. Written comments were solicited and many were received, principally a form letter prepared by the Sisters of Divine Providence opposing the project, and sent by residents.

4. COMMENTS ON DRAFT EIS

On the following pages are presented the official comments received by the Mass. Department of Public Works following publication of the Draft EIS. The letters received are shown on the left side of the page, each comment or question identified numerically. Responses, shown on the right side of each page, are numbered correspondingly. For additional comments on the DEIS and the Public Hearing, see Volume 2.

MEMORANDUM

RE: Conference at DPW January 29, 1985, 10 am.

PARTICIPANTS:		
	Walter Williams	DPW
	Frank Burke	DPW
	Ken Wilman	DPW
	Gabe Brazao	FHWA
	Betsy Higgins	EPA
	Donald Cooke	EPA
	Greg Charest	EPA
	Edward Reiner	EPA
	Jim Mikalaites	Fish & Wildlife
	William Patterson	Dept of Interior
	Morton Braun	TAC
	Marshall Dennis	Cortell Assoc.

DPW interns: Pat Trombly, David Johnston, Paul Chen, Margaret Nutter

This meeting was held to deal with the questions raised by EPA, FWL, DOI following issuance of the DEIS. It was one of a series of meetings which have been held with other state and federal agencies for the same purpose. Some of those present had been furnished with some or all of the new material written by Cortell Associates for the FEIS.

In order to bring all participants up to date, Morton Braun reviewed the events of the past 5 years since the DEIS was issued, principally the adjustments made to the then preferred alignment, 4-M-1 in order to: reduce the number of houses to be taken; avoid houses constructed since the DEIS was prepared; avoid the white-bracted boneset on the shores of Muddy Pond; increase the distance between Muddy Pond and the right-of-way, as requested by the Sisters of Divine Providence; minimize the impacts on the State Forest and Camp Nekon; serve the needs of the Plymouth Industrial Park as well as the industrial areas in Kingston and Plympton; avoid impacts to the Plymouth aquifer; minimize impacts on archaeologically significant sites; minimize impacts on cranberry bogs and other wetlands; accomplish the foregoing while following geometric standards for design.

The group was pleased to hear that a closed drainage system will be utilized throughout the entire length of the road. There was a brief discussion of the retention basins and their outflows to the east and west.

Almost the entire meeting was devoted to a discussion of the wetlands impacted by the now preferred alignment, 4-M-5. The EPA representatives

FIGURE 8-2-1

pointed out that while economic, social and political problems may have been resolved, there are now 55 acres of wetlands to be taken, whereas 4-M-1 would have taken 41 acres, and 4-M, 34 acres. Mr. Reiner stated emphatically that given thepresently available information, EPA could not approve the project. He decried the apparent emphasis given to rèsolving other impacts, while those on wetlands have increased. He also disparaged the concept of replacement as a satisfactory solution.

The discussion focussed on Great Mink Hole: that 4-M-5 will require that it be filled or bridged, in either case, its loss. Since it is a kettlehole, its replacement would be impossible. Mr. Reiner asked whether the road could be diverted at that point to avoid the Hole. The reply was that the geometric standards would probably not permit that.

The EPA representatives indicated that the level of information to be provided in the FEIS would not be sufficient for them to make a finding. Morton Braunpointed out that there appears to be a basic conflict between the level of detail desired by EPA and the level reuired for an FEIS. They were not mollified by statements from DPW representatives that there would be ample time during the design stage for participation and resolution of problems. Nor were they satisfied by the obvious facts that there is no perfect alignment for Route 44, and that in balance the 4-M-5 alignment has resolved a great many problems even if it is not ideal insofar as wetlands are concerned.

The meeting continued after the departure of the EPA group, in order to discuss next steps. It was agreed that Cortell Associates would study the areas adjacent to the impacted wetlands to determine the degree to which mitigation and replacement are possible. It was also felt that while maximum practical mitigation should be proposed in the FEIS, what EPA wants is total avoidance, an impossibility.

In phone calls following this conference, it was agreed to hold a meeting involving Lochner, TAC and Cortell, with various representatives of DPW and FHWA to discuss this problem and related considerations such as the width of the right-of-way, the width of the median area, mitigation measures, avoidance of Great Mink Hole. This meeting has been scheduled for 1 pm at the DPW, Wednesday, February 6.

In a review of the estimated loss of wetlands following the 1/29/85 meeting, Marshall Dennis discovered that the 55 acres included wetlands within the entire right-of-way, including those at the edges, between cut-and-fill lines and the limit of the right-of-way. Exclusion of such wetlands will reduce the total by 21 acres, to 34 acres which is the same as the projected loss for 4-M and less than that for 4-M-1. Narrowing the right-of-way and/or the median will reduce it even more.

The Commonwealth of Massachusetts

Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

EDWARD J. KING
Governor
JOHN A. BEWICK
Secretary

STATEMENT OF THE SECRETARY

ON

DRAFT ENVIRONMENTAL IMPACT REPORT

dated: July 5, 1979
received: July 10, 1979

The Secretary of Environmental Affairs herein issues a statement that the Draft Environmental Impact Report submitted on the below-referenced project does adequately and properly comply with the Massachusetts General Laws, Chapter 30, Section 62 through 62H inclusive and the regulations governing the preparation of environmental impacts reports, subject to the conditions outlined below.

PROJECT NAME: U.S. Route 44 - Carver, Kingston, Plymouth and Plympton

EOEA NUMBER: 01027

PROJECT PROPONENT: U.S. Dept. of Transportation, Federal Highway Admin. and Massachusetts Dept. of Public Works

DATE NOTICED IN MONITOR: May 22, 1979

GENERAL

The appendix referenced on several pages (1,22,70,72) is not listed in the Table of Contents or on the cover or title page as a part of this Draft nor was it provided to this office for review. Information found on several pages of the appendix are vital to an analysis of the environmental impacts and thus should be in the body of the report; not the appendix. These include pp. 33 to 36, the description of the wetland types in the project area and pp. 75 to 82, entitled alternative actions and their potential impacts. The potential impacts include the projected contaminant potential for the alternatives. Additionally, the mass balance calculations and tabulations used to assess the contaminant impacts appear to have been inadvertently omitted. 1

The Summary, Page i would be more useful if the impacts were discussed by alternative.

AGRICULTURE

Cranberry bogs are extremely valuable farmlands in Massachusetts. The impact of this project on cranberry bogs should be further evaluated, including: 2a

- Whether the remaining portions of impacted bogs are economically viable units.

REPLIES TO COMMENTS ON DRAFT EIS

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS JULY 5, 1979

1. Brief descriptions of wetland types are given in the Final EIS. Section 3. The Final EIS also contains mass balance calculations for the impacts of contaminants, as well as discussions of impacts on wetlands for each of the rejected Alternatives and for the preferred Alternative 4-M-5.

2a. MAPS 4-J-1/-14 show the impacts of the right of way on all wetlands, including cranberry bogs. A total of 5.16 acres of cranberry bogs will be aquired. Determination of economic viability of the remaining bogs outside the right of way will be made by the owners involved. It may be possible for owners to improve such bogs by combining and/or enlarging them, or to construct replacement bogs. The Department of Public Works will compensate owners at fair market value for the bogs taken, and the owners will then have to make their own decisions.

2b. The preferred alternative will involve the taking of some bog areas near Pleasant Street, and between Pleasant Street and Spring Street in Carver. The bog taking near Pleasant Street would be at the edge of a bog and would not affect the water supply of the rest of the bog. Due to the installation of culverts beneath the roadway, bog areas located south of the alignment would also not become isolated from their water supply. Between Pleasant Street and Spring Street, Route 44 would create two separate bogs, one on either side of the highway.

2c. Under the closed drainage system proposed for the entire length of the preferred alternative, all highway runoff and associated contaminants will be discharged at three discharge points, located at the Winnetuxet River, Annasnappet Brook, and a brook at Route 3. In this way, contamination of the water supplies of the cranberry bogs in the vicinity of the project will be avoided.

2d. The policy of the Department of Public Works is to maintain a 400' right of way for all new projects such as Route 44. The width of the median has been narrowed from 100' to 60' in order to lessen the impact on cranberry bogs and other wetlands. Consequently, wetlands within the right of way will remain as wetlands from the finished slope line to the right of way line.

2e. Alternative 4M1 is not the selected corridor. The selected corridor, 4M5 is the result of considerable fine tuning of the alignment in order to strike a balance among potential impacts and objectives, and maintain geometric standards. See Section 2.

2f. There appear to be no additional ways to mitigate the impact on cranberry bogs, other than the methods described in responses 2a and 2d above. There is no legal way for the Department of Public Works

- Whether the water supplies of all bogs in the vicinity of the proposed routes will be available to the bogs after development. 2b

- Whether the quality of the water supplies of the bogs will be acceptable after development. 2c

- Whether the quality of the water supplies of the bogs will be acceptable after development. i.e. siltation, turbidity, heavy metals, salts, pH, oil and grease, (and will the contaminants be concentrated by the plants).

- Whether a 400' R of W is necessary in areas of such resources. 2d

- Whether alternative 4-M-1 could be moved 400' north between Brook Street and Sacketts Pond to impact a large wooded swamp rather than 9 acres of a cranberry bog. 2e

- How the impacts discussed above can be mitigated. 2f

WATER QUALITY

The statement that sodium ions "move more slowly and can be trapped" should be explained more fully in light of projected chloride ion concentrations of 111 and 120 mg/l in two water bodies (part of the Plymouth aquifer). The statements that chloride ion concentrations of 111 and 120 mg/l should not adversely impact the flora and fauna of the Ponds should be documented. 3a 3b

More information concerning ground water movements and its potential impact from the projected cost is needed before alternative 4W can be realistically evaluated. 3c

WETLAND

The DEIR does not indicate the quality of flood storage to be lost by each alternative nor where, or by what methods, compensatory storage might be provided. 4

TRAFFIC

As a draft report focussing on corridor selection, the report is satisfactory. However, impacts of the alternatives need much more extensive presentation and analysis before the report can be considered as a final report.

It is understood that with the numerous options at this stage, detailed consideration of the impacts of alternative alignments is difficult. However, the diagram scale in the report is too small to provide a good sense of the effects of any of the construction alternatives. It is recommended that 800-scale ± aerial photos showing up-to-date conditions of forest, open space and other land use aspects of the various corridors would be more explicit, informative and avoid the necessity for extensive verbal description. 5a

directly to replace cranberry bogs. The final decision whether to replace rests with the owners involved. However, if an owner wishes to replace a bog, and if the cost of doing so exceeds the fair market value of the bog to be taken, the Commonwealth of Massachusetts will pay the higher amount.

3a.
3b. The statement regarding sodium ions was made in the context of a discussion of the potential impacts of the various alternatives on groundwater quality. The discussion assumed over-the-shoulder drainage of highway runoff. Under these conditions, sodium ions will move through the soil more slowly and can be trapped in the soil more easily than chloride ions, since the positively charged sodium ions will be attracted by negatively charged soil particles. Chloride ions carry a negative charge.

The proposed drainage system eliminates over-the-shoulder drainage in favor of a closed drainage system with defined surface water discharge points, located at the Winnetuxet River, Annasnappet Brook, and a brook at Route 3. The following table shows the impacts of roadway runoff on winter sodium and chloride concentrations in the receiving bodies under low, average and high salting rates.

The highest resulting concentration of sodium chloride is 619 mg/l. This is substantially lower than concentrations which have been shown to be harmful to freshwater aquatic life. McKee and Wolf (1971) report the results of numerous studies of the effects of sodium chloride on freshwater aquatic organisms. Threshold concentrations for toxic effects varied considerably, but were generally well above 1,000 mg/l. One researcher (Anderson, 1948) recommended a permissible limit of 2,000 mg/l in fresh waters.

References

Anderson, B.G. 1948. The apparent thresholds of toxicity of Daphnia magna for chlorides of various metals when added to Lake Erie waters. Trans. Amer. Fish Soc. 78:96.

McKee, J.E., and H.W. Wolf (eds.). 1971. Water Quality Criteria. Sacramento: The Resources Agency of California/State Water Resources Control Board.

3c. A closed drainage system is proposed for Route 44. Alternative 4-N as has been rejected, for reasons given in Section 2, Subsection 3.

4. As highway design has not yet reached a point in the design process which would facilitate the calculation of flood storage volumes, they are not incorporated in this document. Appropriate mitigation measures, including the provision of compensatory storage will be provided to minimize potential floodplain impacts. Two areas totalling approximately 29.6 acres have been slected for wetland/floodplain creation and compensation. Specific data pertaining to each of these sites with respect to flood storage compensation will be developed during the project's final design phase.

It appears that a fixed trip table has been used to compare the various alternatives. Will improvements to Route 44 generate additional, induced traffic? Does the analysis assume that any area development and traffic growth will occur even if Route 44 is not improved? 5b

Based on information in the Report (Fig.18), traffic volumes on new Route 44 would decrease from 12,000 ADT west of Route 58 to 8400 west of the Plymouth Industrial Park and to 9700 before Route 3. Normally, it might be expected that traffic would steadily increase as one came closer to Route 3. What is the explanation for this phenomenon? How well will adjacent sections of existing Route 44 function with the projected 12,000 ADT? 5c

The overall east-west traffic flow also shows unusual growth patterns. The combined ADT of Route 44 and Plymouth Road west of Route 58 rises from 5640 to 15,200, a 170% increase, while the Samoset St./Cherry St. links just west of Route 3 increase in combined ADT from 21,740 to 28,200, a 30% difference. Why should traffic growth be proportionally so much higher at one end of the project than at the other? Does the lower relative increase near Route 3 reflect congestion in the interchange areas? 5d

It is also noted that Route 3 is projected to encounter 65% traffic increases. How well will both Route 3 and the Samoset and Cherry St. interchanges function under these conditions and what actual changes to interchanges are proposed as part of this project? 5e

Further documentation should be presented as to the need for a four-lane expressway facility. It is understood that initially only a two-lane roadway will be constructed. Access to the Route 3 interchanges and Route 3 itself may be a more critical capacity restraint in the future than will a two-lane Route 44. The Final Report should document the location of the most significant bottleneck or capacity restraint between Route 3 and Route 44. 5f

In the event that the Department determines to maintain the future option of providing for four lanes on Route 44 and thus acquires a substantial right of way of 300-ft. width, all initial construction should be restricted only to that area involved in the two-lane roadway itself. The intent should be to avoid early excavation and filling for an anticipated widening which may never occur. Such conditions are in evidence for sections of Route 2 between Phillipston and Millers Falls. 5g

Route 44 must serve a dual purpose as a commuter/commercial transportation route and as a tourist route to Plymouth and the Cape. This goal would seem to favor a scenic and well landscaped parkway-type treatment to road design. How might the aesthetics of the road and environs be enhanced through design, route layout, landscaping and guardrail treatment, etc.? 5h

EXISTING AND RESULTING WINTER CONCENTRATIONS

(mg/l)

	Discharge 1				Discharge 2				Discharge 3			
	Winnetuxet River				Annasnappet Brook				Route 3 Brook			
	Existing	Resulting			Existing	Resulting			Existing	Resulting		
		Low	Avg	High		Low	Avg	High		Low	Avg	High
Sodium	5.1	11	12	13	5.1	82	102	114	125.0	222	253	270
Chloride	9.8	18	21	22	7.5	126	158	178	115.0	276	322	349

5a. Current aerial photos of the project area are not available, but will be obtained in the design phase. Controlling features are indicated in the attached MAPS 4-J-1 to 4-J-14.

5b. The analysis is based on the assumption that full area development, with concomitant traffic growth, will occur with or without Route 44 improvements.

5c. Relocated Route 44 terminates at the interchange with Route 3 and provides only an indirect connection to Cherry Street. Most of the traffic destined for Plymouth center will still be expected to use Samoset Street. Additionally, a major part of new development is located south of existing Route 44 and west of Route 3, while a good portion of the new Route 44 traverses open space areas which are expected to remain undeveloped. As a result, the traffic volume projections reflect the heavy demand to Route 80 and Samoset Street and show a substantial through traffic reduction at Spring Street. It should be noted that the projections are based on an assumption that Parting Ways Road will be improved to serve as an important local access road from the west. Should this road remain unpaved, it could not handle the projected traffic load, resulting in higher traffic volumes on Route 44.

5d. The area at the east end of the project is almost completely developed, while the area at the west end is experiencing significant growth. Traffic volume projections reflect this growth differential.

5e. The Samoset Street and Cherry Street interchanges will be improved and reconstructed, and operational lanes will be added between the two interchanges to improve traffic flow.

5f. A four-lane expressway facility will be constructed during the initial construction phase. The most congested interchange will remain at Samoset Street, but conditions will be improved when this interchange is reconstructed.

5g. New Route 44 will be built in a 400' right of way, but its median will be 60' instead of 100'.

5h. The wider corridor width provides enhanced opportunities for landscaping and spiral cross-sectioned treatments (i.e. berms, flatter slopes, opportunities to blend into existing natural edges, etc.).

The Draft EIR notes that one of the environmental impacts of the project would be to improve the connection for civil defense purposes between Brockton and the reception area in Plymouth in the event Brockton needed to be evacuated, as well as travel out of Plymouth in case of malfunction at the Pilgrim nuclear plant (p. i). The discussion of this impact is not evident in the text, and the matter should be considered in terms of traffic volumes expected, the disposition of Plymouth traffic in the event both Brockton and Plymouth need to be evacuated, and where the system bottlenecks would be for an evacuation from Plymouth in the event of a nuclear plant emergency. 5i

Environmental Impact p. ii: Why is the creation of a shuttle service between Route 3 and Downtown Plymouth necessarily connected with Route 44 improvements? 5j

Any service roads, ramps, and parking areas which might be considered as part of any alignment should be described and illustrated in the Final Report. The Draft Report fails to discuss the impacts, alternatives or mitigating measures for the proposed frontage road between the Cherry Street and Smith's Lane interchanges of Route 3 and the proposed commuter parking and access ramps near the Plymouth town well at Triangle Pond which are mentioned in the Appendix. 5k

AIR POLLUTION

To clarify a key element in the air pollution analysis, the actual emission factors used in the study should be presented in tabular form, in the context of the discussion on page 95 of the appendices. 6

NOISE

The text on page 85 of the Appendix Volume indicates that truck noise volumes on existing sections of Route 44 would be assumed to be 75 dBA, whereas relocated sections of Route 44 would be assumed to be 82 dBA. It may be necessary to modify Figure B-3 under the partial relocation to correctly reflect these assumptions. What is the explanation for the significant 7 dBA difference between the existing and new road conditions? Would the higher speed new roadway be assumed to generate higher noise levels? 7

The highway noise levels were modeled on the assumption of "Uninterrupted smooth traffic flow", which may be questionable considering the signalized intersections along the route and the numerous truck tire skid marks near intersections on existing Route 44 Southwest of the project.

OTHER

The barrier effects of the roadway should be considered. Will the road be fenced on both sides? If so what are the implications for pedestrian, auto and animal access across the right-of-way? 8

Copies of comments reviewed in response to the Draft are enclosed and should be responded to in the Final Report.

July 5, 1979
DATE

John A. Bewick
JOHN A. BEWICK, SECRETARY

5i. System bottlenecks will remain on local roads. Evacuation movements would be expedited once traffic reaches Route 3 and new Route 44. The sentence in the Draft EIS regarding emergency evacuation should be considered as having been deleted.

5j. It was believed desirable to investigate possible connections to points in central Plymouth in lieu of extending Route 44 eastward from Route 3. A shuttle service has been operating within Plymouth. There is a park-and-drive area in the Plymouth Industrial Park.

5k. Although the present commuter parking area may need to be relocated, an alternative site has not yet been selected. This matter will be addressed during final design, and attention will be given to locations as close to the present one as possible.

6. Emission factors are discussed in Section4, Subsection 3, and in the Technical Appendix, Section 3.

7. The truck noise level of 75 dBA at 50' used in modeling truck traffic noise along existing Route 44 was based on actual field measurements along Route 44. The assumed emission level of 82 dBA at 50' for trucks on a relocated Route 44 is the value prescribed in NCHRP-117, the FHWA approved traffic noise model (as of 1979 when the DEIS was prepared). This value of 82 dBA has been verified by field measurements on other limited access roads in Massachusetts. The reason for the 7 dBA higher emission level under limited access conditions is primarily the higher speed.

Noise levels may be up to 3 dBA higher than predicted near signalized intersections, due primarily to acceleration of trucks that have stopped or slowed down for a red light, but differences of 3 dBA are imperceptible to the human ear. The added noise from acceleration of trucks would not significantly affect the overall conclusions from the noise impact analysis, because the noise descriptor, L-10, is based on a one-hour period.

8. Route 44 will be a limited access highway, and will be fenced. Abutments will be designed to facilitate movements by animals. There will be no pedestrian or auto access except, of course, at interchanges.

The Commonwealth of Massachusetts
Department of Food and Agriculture
Leverett Saltonstall Building, Government Center
100 Cambridge Street, Boston 02202

June 27, 1979

Mr. John Bewick, Secretary
Office of Environmental Affairs
Leverett Saltonstall Building
100 Cambridge Street,
Boston, Massachusetts 02202

RECEIVED
JUL 2 1979
OFFICE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS

Subject: EOEA #01027
Draft Rt. 44, D.P.W.

Dear Secretary Bewick:

The Draft E-I-S of April 1979 regarding U.S. Rt. 44 appears to be inadequate in several aspects. Part II, Section 3, mentions the loss of cranberry bogs as a consequence of highway relocation in only one alternative route (3W/3E), yet, it is our understanding that every proposed alternative would cause loss of active bogs (3W/3E: 9 acres; 4-L: 12 acres; 4-M: 17 acres; 4-M-1: 9 acres; 4-N: 23 acres).

1. The Draft E-I-S should above all measure the economic loss resulting from conversion of such land, now considered "unique agricultural lands" in Important Lands Inventory of the Soil Conservation Service of the U. S. Department of Agriculture. (In Carver, 80% of the land classified as agricultural is cranberry bog.) 9

2. Additional environmental questions should be answered:

a) Will run-off affect water resources in the bog areas? Will heavy metals be taken up by the cranberry crop? 10

b) What kind of migration of roadway generated metals will occur through surface waters? 11

c) What will be the effect of a decline in bog pH, increases in iron, and increases in turbidity and suspended solids? 12

DEPARTMENT OF FOOD AND AGRICULTURE **JUNE 27, 1979**

9. See Replies 2a, 2d and 2f above.

10. See Replies 3b and 2c above.

11. The closed drainage system proposed for Route 44 will limit the discharge of metals from the roadway to three receiving surface water bodies. Since metals adhere to soil particles, a portion of the metals washed off the roadway will be removed from the runoff water in the retention basins. Metals that remain dissolved or associated with suspended particulates will be discharged to one of the three streams. In the streams, dissolved metals will be carried away from the Route 44 area. Metals associated with suspended particulates will also be carried downstream, but may settle out and become associated with stream sediments in areas of low flow velocity.

12. See Replies 2b and 2c above.

3. No mention is made of relocation assistance or compensation by means of comparable land. With the agricultural value of cranberry bogs the highest of all land use classes according to the Farmland Valuation Advisory Commission, the economic loss is considerable. 13

4. Social impacts of decreasing the agricultural base should be discussed in the Draft. 14

For these reasons, I would recommend that the Draft E-I-S not be accepted without dealing with these concerns.

Sincerely,

Frederic Winthrop, Jr.
Commissioner

FW/:R/dm

cc: Commr. Amidon
Carver Bd. of Selectmen
Cape Cod Cranberry Growers Assoc.
David Shepherdson

13. See Replies 2a, 2d and 2f above.

14. Owners of cranberry bogs may replace those taken for the right of way, using the method discussed in Reply 2f above. Since the agricultural base may not decrease at all, or at the most by 5.16 acres, possible social impacts will be non-existent or infinitesimal.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER-79/496

JUL 6 1979

Dear Mr. Van Ness:

This responds to a request for the Department of the Interior's comments on the draft environmental/Section 4(f) statement for US-44, Plymouth County, Massachusetts.

GENERAL COMMENTS

The alternative impacts of the project are presented in a very disjointed manner. A detailed analysis of project impacts should be made clear to the reader. Although assembling the discussion of all alternatives under each impact category enables the reader to make a comparison for that particular impact, it doesn't lend the reader an overall picture of the impacts associated with each alternative. Thus, the reader is forced to flip through the document to make such a comparison. The final statement could alleviate this by discussing all impacts associated with each alternative, or by following the existing format and incorporating a section summarizing the major impacts of each alternative.

PRELIMINARY SECTION 4(f) COMMENTS

The Parting Ways Archeological District (106 acres) was entered into the National Register of Historic Places on March 19, 1979. The final environmental statement should indicate this status. The significance of the area, as well as its research potential, is discussed in a recent publication (James Deets, In Small Things Forgotten, Anchor Press/Doubleday, Garden City, New York, 1977, pp. 138-154). Corridor L would cross the District and would require 23 acres. We object to Section 4(f) approval of Corridor L because there are feasible and prudent alternative corridors. 15

Alternative 4-M-1 will require land from Kingston State Forest and from Camp Nekon; Alternative 4-M would require land from Camp Nekon. The design for full route relocations as discussed on page 51 evidently has not been decided - i.e., 2 lane or 4 lane construction. Two lane construction would require less right-of-way and could potentially avoid the taking of Section 4(f) land along Corridor M. Even if 4 lane construction is justified, it appears that the proposed 100 foot median could be reduced to avoid Section 4(f) taking along Alternative 4-M. 16

U.S. DEPARTMENT OF INTERIOR JULY 6, 1979

15. Alternative 4L has been rejected.

16. The impact of a 400' right of way for Route 44 on Camp Nekon and the Kingston State Forest is discussed in the 4(f) Evaluation, along with measures to mitigate the impact.

Mr. Norman J. Van Ness, Boston, Massachusetts

The Section 4(f) discussion does not include any evidence of coordination with the officials having jurisdiction over Kingston State Forest or Camp Nekon concerning the suitability and manageability of the proposed replacement acreage. Furthermore, the statement appears on page 4(f)14 that "The assumptions (our emphasis) are made that these isolated parcels (from the Sisters of Divine Providence Property) will be purchased by the State as part of its acquisition for the corridor, and that the State will then sell or dedicate them to the abutting State Forest and Camp Nekon." Until the assumptions become fact, we cannot agree that all possible planning to minimize harm has been accomplished.

Thus, based on the limited information and analysis provided in the draft environmental/Section 4(f) statement, we cannot agree either that there are no feasible and prudent alternatives to the use of Section 4(f) land or that all possible planning to minimize harm has been accomplished for Corridor M.

ENVIRONMENTAL STATEMENT COMMENTS

Cultural Resources

Figure 4(f)-2 identifies two areas of potential historic significance: the Lucas Family Cemetery which could be affected by upgrading existing Route 44 and Cole Mill which would be effected by all alternatives except the "No Build." The draft statement does not discuss either of these properties or potential impacts. Information on the history and significance of these sites and an evaluation of their eligibility for inclusion in the National Register of Historic Places should be included in the final statement. The State Historic Preservation Officer should be consulted. 17

Pages 18-19 provide a good indication of the archeological potential of the study area. However, there is no further mention of specific archeological field survey work that has either been conducted or is planned to identify properties that may be eligible for the National Register. Archeological field survey work should be performed in the study area, and the results and appropriate recommendations should be included in the final statement. 18

17. The proposed corridor will not affect any historic sites.

18. A site of important archaeological interest has been identified. Please refer to the 4(f) Evaluation and Section 4 of this document.

The Department of the Interior contends that historic properties may be locally significant within the context of Section 4(f) of the Department of Transportation Act, as amended, even though they may not be eligible for the National Register. This should be considered by you in the final environmental/Section 4(f) statement.

<u>Fish and Wildlife Resources</u>

The draft statement inadequately discusses the natural resources present in the project area and the impact the project will have on these resources. It deals expansively with the economic and social benefits associated with the project, and cites economic development as its prime objective. The area's natural resources are handled in a very cursory manner. The document erroneously concludes that the wetland loss will be relatively insignificant because the acreages which will be impacted by the project represent only a small percentage of the regional wetland resource. This deduction indicates a lack of understanding for the value and function of wetlands.

19 Wetlands in the project area are lumped together by wetland type. This approach does not delineate the significance of one area compared to another. All wetlands of the same type are not of equal value. Their value is a product of a number of factors including size, association with other wetland types, surrounding vegetation, density, location in regards to surface water bodies, and even proximity to developed areas. Such a distinction between the various wetlands should be made in the final document. Areas which receive more recreational and educational attention should be cited.

20 The statement lists the variety of wildlife species which may be found in the project area but fails to link them with any specific habitat. Such a system does not enable the reader to deduce the natural resource value of one highway alignment over another. The final statement should discuss the utilization of the various habitats by these species, their abundance, and the value of this resource, both recreationally and educationally, to the surrounding communities.

21 Many of the impacts on natural resources are discussed in a very vague manner and are not accompanied by supporting evidence. Certain impacts are omitted from discussion. These include the impact that secondary development will have on the wetland-upland ecosystem and the loss of certain species through roadkills.

19. The regional analysis of wetland impacts contained in the Draft EIS was presented exclusively to place potential wetland effects in a regional perspective.

It is recognized that not all wetlands of the the same type are of equal value. Consequently, the discussion of wetlands and associated impacts contained in the Final EIS addresses individually the value of each wetland potentially affected by project implementation.

20. The Final EIS provides a list of wildlife species associated with each wetland community type within the proposed alignment. The wildlife-related use and value of individual wetlands traversed by the preferred Alternative 4-M-5 is described in Section 3 of this document.

21. Wetland-related impacts associated with potential secondary development and wildlife losses resulting from highway operation are discussed in the Final EIS. With respect to potential secondary development impacts due to the presence of the proposed Route 44, such effect to wetlands, if any, are anticipated to be minimal. This is primarily due to the limited access provided along the Alternative 4M5 alignment and the limited extent of wetlands in the vicinity of proposed access locations.

Wetland wildlife losses may be expected during highway operation, particularly due to wildlife-vehicle collisions. The occurrence and frequency of such collisions have been attributed to a variety of factors, including meteorological conditions; the availability of food, cover, water, and breeding sites; behavioral responses of wildlife; daily and seasonal movement patterns; existing wildlife population levels; and the plant species composition of highway rights-of-way, among others. Although mortality among certain groups of wildlife, such as mammals and birds, may be more frequently observed, wildlife-vehicle collisions have also been documented for reptiles and amphibians. Such wildlife-vehicle collisions will inevitably occur during operation of the proposed Route 44 roadway.

4

Mr. Norman J. Van Ness, Boston, Massachusetts

We offer the following specific comments on the draft environmental statement:

Page 16, 5th paragraph - Here and elsewhere, reference is made to information contained in Appendices which were not sent to reviewing agencies. 22

Page 17, 1st paragraph - The plants listed here are not on the Federal list of Endangered or Threatened Plant Species. They are presently being studied and considered for possible listing as threatened species. 23

Page 50, 5th paragraph - This paragraph notes that Doten Brook will be relocated should Alternative 3-W be selected. Stream channelization can have significant adverse impacts on fishery resources. Some mention should be made regarding what species occupy Doten Brook and how channelization impacts will be mitigated. 24

Page 64, 7th paragraph - Filling of wetlands represents a change in land use. This statement should reflect this change. 25

Page 67, 5th paragraph - This paragraph contains erroneous information. Displaced wildlife species will compete with residents of adjacent areas for habitat. These areas are at or near their carrying capacity. Such competition will result in a loss of individuals and a potential change in species composition. Certain species habitat requirements will be enhanced by alterations in the environment while other species will suffer a decline. This paragraph should be changed to reflect this adverse impact. 26

Page 69, 1st paragraph - This paragraph contains incorrect information for the reasons stated above. The impact of creating an edge between wooded and open land will selectively benefit certain species over others. The overall impact will undoubtedly be a negative one. 27

Page 70, 8th paragraph - This paragraph reflects the tone of the entire document in regard to area natural resources. The filling of between 30 and 40 acres of wetland habitat and the secondary impact to additional acres makes this a very substantial loss.

Pages 72, 4th paragraph and 73, 2nd and 3rd paragraphs - Here as well as elsewhere, adverse impacts to area natural resources are cited without a discussion of how they will be mitigated. Mitigative measures should be detailed in the final statement. 28

22. As far as can determined, the Appendix was sent to reviewing agencies.

23. The Final EIS has been updated to reflect the most recent listing of Federal and State endangered and threatened plant and wildlife species. None of these species will be effected by the proposed project.

24. Doten Brook, which passes through several cranberry bogs and other wetland areas before its confluence with Muddy Pond Brook in North Carver, may be expected to support a warmwater fishery. Typical warmwater species include largemouth bass, pickerel, yellow perch and sunfish.

Physical alternation of a stream, including relocation and channelization, can indeed have an adverse impact on fishery resources by changing habitat structure and flow regime. Possible mitigation measures to limit these impacts include timing of relocation activities to avoid spawning seasons; minimization of the length of stream actually altered; and selection and grading of the stream relocation area to duplicate to the extent possible conditions in the existing stream.

The currently proposed build alternative however, passes to the north of Doten Brook and will not require any channelization or relocation of Doten Brook.

25. All references to wetland losses contained in the Final EIS acknowledge that such losses constitute a change in land use.

26. The potential effects of wetland wildlife displacement are discussed in the Final EIS. It should be noted, however, that the carrying capacity of unaffected uplands and wetlands can only be assumed to be realized. This would constitute a worst-case condition with respect to potential wildlife impacts associated with the loss of existing habitats. Wetland wildlife impacts are addressed in terms of this worst-case condition, as well as the possibility that surrounding habitats unaffected by the proposed alignment have not reached their carrying capacity. Regardless, no long term or permanent effects on regional wildlife populations are expected.

27. It is recognized that project implementation and the creation of roadway edge communities will benefit certain wildlife species, and that certain unavoidable adverse impact to wildlife will result from the proposed roadway. A variety of measures, however, will be implemented to mitigate these impacts. Such impacts and mitigation measures relative to project area wetlands are discussed in the Final EIS.

28. An evaluation of mitigation measures associated with wetlands is presented in Section 4, Subsection 1 of this document.

Mr. Norman J. Van Ness, Boston, Massachusetts

Geological/Hydrological Resources

It is mentioned in the detailed analyses of alternatives that one or more alternatives would cross several areas of 100-year flood plain (p. 72) and that at least one alternative would require a significant stream relocation, comprising about 3,000 feet of Doten Brook (p. 103). It would be helpful to mention these impacts in the summary (p. i, ii). 29

It is noted in the detailed descriptions of alternatives that cuts as deep as 90 feet would be required on one alternative and fill as thick as 40 feet on another. Because of the significant amount of earthwork that would evidently be involved, it would be helpful to provide an estimate of the total volume and an evaluation of whether fill would need to be imported or excess excavated material disposed of. The proposed sources of borrow material or sites of disposal should be identified, as appropriate. 30

The draft statement appears generally to adequately address the potential impacts on groundwater. Two items should be considered, however: (1) The assumed area of influence around each of the public supply wells may actually be greater than shown on Maps N, O, P, and Q, particularly during a dry summer; and (2) Consideration should be given to the construction of closed drainage systems with snow berms in the drainage areas of potentially impacted ground-water supplies. 31

FISH AND WILDLIFE COORDINATION ACT COMMENTS

The project will require U.S. Army Corps of Engineers permits. The U.S. Fish and Wildlife Service will review the permit applications and provide comments and recommendations pursuant to the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The environmental impact statement, at present, does not contain sufficient information for the U.S. Fish and Wildlife Service to establish what recommendations they will make on future Corps permits. However, the Service will scrutinize any wetland filling, consider utilization of viaducts as opposed to filling certain wetlands of prominent significance, and recommend measures to mitigate project impacts to natural resources. 32

SUMMARY COMMENTS

The "Preliminary Section 4(f) Comments" in this letter are provided to give you an early indication of our thoughts about the Section 4(f) information and involvements. They do not represent the results of

29. Both of the alternatives referred to have been rejected.

30. It is estimated that the construction of the preferred alignment will result in about 1,000,000 cu. yds. of excess material. However, due to the nature of the material, it is anticipated that the contractor will be able to dispose of it constructively.

31. A closed drainage system will be constructed to minimize potential groundwater effects. As indicated in responses to comments by the U.S. Environmental Protection Agency, none of the discharge locations associated with the proposed roadway drainage system is located within the area of influence of any existing municipal well.

32. Any additional data needed for permits other than what is in the Final EIS will be generated during the design stage.

formal consultation by the Department of Transportation (DOT) with the Department of the Interior, pursuant to the consultative requirements of Section 4(f) of the DOT Act. Such requirements would be fulfilled only when the Office of the Secretary of this Department comments separately on any Section 4(f) statement which may be prepared and approved by you for circulation.

As this Department has a continuing interest in the project, we would be willing to cooperate and provide technical assistance in further project assessment and in the development of additional documentation for review. The field office assigned responsibility for overall coordination of this project and for technical assistance about park, recreation, and cultural resources is: Regional Director, Heritage Conservation and Recreation Service, Northeast Region, 600 Arch Street, Room 9310, Philadelphia, Pennsylvania 19106. For matters concerning fish and wildlife resources, contact the New England Area Manager, U.S. Fish and Wildlife Service, P.O. Box 1518, Concord, New Hampshire 03301.

Sincerely yours,

Larry E. Meierotto
Assistant Secretary of the Interior

Mr. Norman J. Van Ness
Division Administrator
Federal Highway Administration
100 Summer Street
Boston, Massachusetts 02110

cc: Mr. Dean P. Amidon
Commissioner
Massachusetts Department of Public Works
100 Nashua Street
Boston, Massachusetts 02114

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS

October 3, 1979

Mr. Norman J. Van Ness
Division Administrator
U.S. Department of Transportation
Federal Highway Administration
Suite 1517, 100 Summer Street
Boston, MA 02110

RE: D-FHW-B40039-MA

Dear Mr. Van Ness:

We have completed our review of the Draft Environmental Impact Statement (EIS) and Section 4(f) Document on U.S. Route 44, Plymouth County, Massachusetts. In accordance with our national EIS rating criteria, a copy of which is enclosed, we have rated this Draft EIS ER-3.

In our preliminary determination, we have expressed reservations about the proposed project because of:

- Concern for the protection of the Plymouth aquifer from degradation of water quality;

- The direct and associated impacts of the proposed project on wetlands;

- Incomplete evaluation of all possible mitigation measures to avoid water supply and wetlands impacts; and

- The lack of a selected alignment. ?

The concerns outlined above, as well as comments with respect to air and noise assessments are detailed in the following comments. These comments are for your use in preparing the Final EIS.

A. WATER SUPPLY IMPACTS

Although the Draft EIS recognizes the regional significance of the aquifer underlying the proposed project area, its value cannot be overemphasized. As discussed in the South Eastern New England Report ("Report of the Southeastern New England Study", 1975, South Shore Planning Area Report (3), New England River Basins Commission) a number of communities along the South Shore of eastern Massachusetts might require water supplies from the Plymouth area over the next few years.

Mr. Norman J. Van Ness
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As such, together with existing demands from within the study, protection of this invaluable groundwater resource must be established as a consideration of paramount importance in evaluating the project's future.

The Plymouth aquifer, which underlies virtually the entire study area, appears to have the potential for designation as a "sole source" aquifer. Two water quality areawide management plans (Old Colony Planning Council, and Southeastern Regional Planning and Economic Development District) for areas adjacent to the project area stress the importance of preventing groundwater contamination. Recommendations in the management plans include measures for the protection of the intermunicipal aquifer and water supply watersheds.

The major potential contributor to water quality degradation in the study area will be the winter de-icing program which will raise the ambient chloride levels. The de-icing program will also effect the ambient sodium level. The level of sodium in the groundwater and the impacts of increased sodium concentration in drinking water should be addressed by the Final EIS. 33

Considering the proposed increase in salt application (present 2 tons per lane mile under the direction of the Town of Plymouth, to a potential average 13.5 tons per lane mile under the direction of Massachusetts Department of Public Works) the state's de-icing policy for the areas which may impact the aquifer should be reevaluated. A reduction in the amount of de-icing chemicals applied by highway maintenance crews may be in order. The application of sand and calcium chloride in place of sodium chloride or the adoption of a low-salt level of service for roads passing through the watershed of public water supplies which exceed the Massachusetts State sodium standard of 20 milligrams per liter should be considered.

All project alternatives presented in the Draft EIS appear to have a high potential for impacting the quality of groundwater in the project vicinity. This pertains to groundwater currently being used as a water supply source as well as groundwater resources which might be needed in the future. As such, it is recommended that measures necessary to preclude any groundwater degradation be implemented with the chosen alternative.

Utilizing closed drainage systems in the vicinity of municipal wells and potential wells is a measure to protect the aquifer from chemical contamination resulting from de-icing practices, road runoff and spills. The Final EIS must address the capacity of the closed drainage system (should coincide with best management practice), the method and location of discharge and the environmental impacts of discharging. Proper 34

U.S. ENVIRONMENTAL PROTECTION AGENCY OCTOBER 3, 1979

33. Recognizing the potential for contamination which is posed by the use of winter deicing chemicals on the proposed roadway, the final design will incorporate a closed drainage system with discharges at three locations. Discharge at these points will be into surface water features: the Winnetuxet River, Annasnappet Brook, and an unnamed tributary to Stone Pond, which discharged into Plymouth Harbor. All roadway runoff will also be directed to sedimentation/retention basins prior to discharge. The discharge locations are not located within the area of influence of any existing municipal wells, although the Town of Plympton has identified a potential well site downstream of discharge location #2. Plympton, however, currently has no plans for the development of this potential well site. Consequently the potential for contamination of the aquifer is limited. Mixing and dilution with surface waters will minimize potential impacts to existing low yield private wells in the vicinity of receiving waters.

34. All discharges from the closed drainage system will be to surface water bodies. No outlets are located where impacts to existing municipal wells can occur.

Water quality impact analyses have been conducted for the following drainage alternatives:

1) Closed drainage from Route 3 west to the Annasnappet Brook/Winnetuxet River drainage divide, and open drainage into the Winnetuxet River from that point west to Route 58;

2) Closed drainage throughout the entire length of the roadway with four discharge locations: a brook at Route 3, Smelt Pond, Annasnappet Brook, and the Winnetixet River;

3) Same as (2) above, but with discharge into Smelt Brook instead of Smelt Pond; and

4) Closed drainage throughout the entire length of the roadway with three discharge locations: the Route 3 brook, Annasnappet Brook, and the Winnetuxet River.

The last alternative has been selected as the most effective in protecting both groundwater and surface water quality. The choice of a closed drainage system, however, has resulted in impacts which are different from those usually encountered in highway water quality impact analyses. The protection of groundwater from contamination by sodium chloride by capturing it in a closed drainage system results in the capture of other pollutants which ordinarily become bound to roadside soils after draining over the shoulder and rarely become a water quality concern. These other pollutants (metals and nutrients) are thus introduced to receiving waters in runoff from a closed drainage system at higher concentrations than in runoff which has flowed over unpaved roadside areas before entering receiving waters. Also, unlike roadway deicing compounds, they are present year-round. Thus, while a closed drainage system which captures salt and other pollutants may not have serious detrimental effects on receiving water quality during high-flow periods, during summer low-flow periods more severe water quality impacts could be encountered.

[illegible] for discharge into Smelt Pond is discharged into Annasnappet Brook. The following table also shows the roadway drainage area for each discharge point. An alternative with the same three discharge points, but with runoff from the Smelt Pond highway segment being discharged into the Route 3 brook, was considered but rejected because its requirement of three pumping stations rendered it infeasible from an engineering standpoint.

ROADWAY DRAINAGE AREAS

Area Draining To	Location of Discharge	Length (ft)
Discharge 1	Winnetuxet River	7,700
Discharge 2	Annasnappet Brook	20,900
Discharge 3	Brook at Route 3	8,600

Highway-generated pollutant loadings were obtained using the method described in Predictive Procedure for Determining Pollutant Characteristics in Highway Runoff, Volume III of Constituents of Highway Runoff, a 1981 FHWA report (FHWA/RD-81/044). This model simulated pollutant accumulation and washoff during a specified period for which accurate hourly precipitation data are available. Since the procedure is not meant to evaluate winter snow melts, only non-winter periods may be examined. The model itself is based on monitoring data gathered from five highway sites around the country during 1976 and 1977.

The lead loadings calculated by the FHWA procedure were reduced to reflect sharp decreases in the amount of leaded gasoline sold in the United States as a fraction of total gasoline sales. In 1976-1977, when the FHWA study was conducted, approximately 75% of the gasoline sold nationwide was leaded gasoline, according to Christopher Freitas of the Department of Energy's National Energy Information Center in Washington. By 1983, that percentage had dropped to approximately 45% for the nation, and 38% in Massachusetts (Marjorie Cox, Massachusetts Department of Revenue). The Lundberg Letter, a petroleum industry newsletter, has projected that the national percentage of leaded gasoline sold will decrease to approximately 26% by 1987, and to approximately 19% by 1990 (James Ayotte, Bay State Gasoline Retailers).

By 1987, then, the percentage of leaded gasoline sold in the nation is expected to decrease by 2/3 of the 1976-1977 percentage of 75%. To reflect this decrease, lead loadings calculated by the FHWA procedure were also reduced by 2/3, since leaded fuel is the principal source of lead in highway runoff.

Winter loadings of sodium and chloride from road salt were obtained more directly from data supplied by the Mass. DPW. According to Steven Soares of the District 7 DPW office, salt use in the Whitman section of the District (in which Route 44 is located) has totaled the following amounts over the last several years:

Year	Tons	Tons/lane-mile
1977-79	2,000	14.39
1978-79	—	—
1979-80	—	—
1980-81	2,085	15.00
1982-83	1,885	13.56
Average	1,860	13.38

Values in the third column are based on the 139 lane-miles in the Whitman section. The low (10.58 tons/lane mile), average (13.38 tons/lane-mile), and high (15.00 tons/lane-mile) salt use rates were used in subsequent analyses.

Winter roadway runoff volumes were computed on the basis of 1.70 ft. of precipitation (November through March), the average for 1941-1970 for Plymouth, and a runoff coefficient of 0.95. The resulting volumes and calculated loadings yield average winter runoff concentrations of approximately 900 to 1,300 mg/l Na and 1,400 to 2,000 mg/l Cl.

Current drainage plans call for sedimentation basins ("paved sedimentation-retention pools") to be located at various points along Route 44. These basins would serve to remove varying amounts of highway-related pollutants from the runoff before it is discharged to surface waters. To account for this removal, loadings for the following pollutants were reduced by the percentages shown below:

Parameter	Removal Efficiency
Lead	20.0 %
Zinc	25.0 %
Iron	37.0 %
Cadmium	7.0 %
Total Nitrogen	14.0 %

Source: Cost Estimates for Construction of Publicly-owned Wastewater Treatment Facilities - 1976 Needs Survey, U.S. Environmental Protection Agency Report No. 430/9-76-101, February 1977.

Dilution volumes were calculated for each receiving stream for winter (November through March), non-winter (April through October), and low-flow conditions. Winter flows were estimated from U.S. Geological Survey (USGS) flow data for the Jones River at Kingston and the Indian Head River at Hanover. The estimates were in good agreement with estimates based on USGS Hydrologic Atlases for the region (HA-460, HA-504, and HA-507). The estimated flows were summed over 150 days to yield winter dilution volumes. A similar procedure was used to generate estimates of non-winter stream flows, which were summed over 214 days to yield non-winter dilution volumes. Low flows (7Q10) were estimated with methods derived from the USGS Hydrologic Atlases for the region, and summed over one day to yield low-flow dilution volumes.

For mass balance calculations, existing water quality data for each receiving body were used to yield average ambient pollutant concentrations.

The various pollutant loadings and water volumes determined to this point were then used to calculate final concentrations of sodium and chloride for the winter (150-day) scenario, and final concentrations of chloride, metals, and nutrients for the non-winter and for the low-flow situations. The equation was:

$$C_f = \frac{C_r V_r + C_d V_d}{V_r + V_d}$$

where:

C_f = final concentration (mg/l)
C_r = concentration in roadway runoff (mg/l)
C_d = concentration in diluting waters (mg/l)
V_r = roadway runoff volume (l)
and V_d = dilution volume (l)

The results of the mass balance calculations are shown in the tables on the following pages. Winter concentrations of sodium and chloride show substantial increases over existing concentrations, except at Discharge 1, where the increases are more moderate. Resulting ambient concentrations in Annasnappet Brook are approximately fifteen to twenty-five times existing concentrations; concentrations in the Route 3 brook show a two- to three-fold increase. While the changes in sodium and chloride content in the receiving waterways may appear dramatic, they are the result of the intentional shift from over-the-shoulder drainage to a closed drainage system with subsequent discharge to a stream. Because of this change in drainage the impacts are unavoidable. However, groundwater is protected from contamination and the high salt concentrations in the streams will not reduce the ability of benthic biota, fish, or plants to reproduce and grow in the streams. The resulting concentrations are well within the range of concentrations tolerated by even the most sensitive of organisms inhabitating the streams.

Resulting concentration for the non-winter period generally show little change from existing concentrations. Calculable increases occur for total nitrogen at Discharge 2, and for cadmium and total nitrogen at Discharge 3, but the resulting concentrations are still low. In contrast with winter conditions, the non-winter chloride concentrations show little change.

The low-flow, intense-storm scenario shows the highest resulting concentrations for all pollutants except chloride. This worst-case scenario reflects the maximum period of pollutant accumulation allowed by the model (20 days), followed by an intense 1-year, 30-minute storm (0.8 inches), resulting in high runoff rates and pollutant washoff. Increases at Discharge 1 (Winnetuxet River) are still moderate. Discharge 2 (Annasnappet Brook) experiences larger increases, especially for zinc and total nitrogen, both of which show approximately nine-fold increases in concentrations. The highest resulting concentrations occur at Discharge 3 (Route 3 Brook), which has the smallest natural drainage area and the lowest 7Q10 flow. The sharpest increases are for zinc, total nitrogen, and total phosphorus (six to eleven-fold), with lead and cadmium showing approximately four-fold increases.

The drainage design calls for paved sedimentation-retention basins along the roadway. These basins will serve the dual function of controlling peak flows and reducing the amount of pollutants

EXISTING AND RESULTING WINTER CONCENTRATIONS

(mg/l)

	Discharge 1				Discharge 2				Discharge 3			
	Winnetuxet River				Annasnappet Brook				Route 3 Brook			
	Existing	Resulting			Existing	Resulting			Existing	Resulting		
		Low	Avg	High		Low	Avg	High		Low	Avg	High
Sodium	5.1	11	12	13	5.1	82	102	114	125.0	222	253	270
Chloride	9.6	18	21	22	7.5	126	158	176	115.0	276	322	349

EXISTING AND RESULTING NON-WINTER CONCENTRATIONS

(mg/l)

	Discharge 1		Discharge 2		Discharge 3	
	Winnetuxet River		Annasnappet Brook		Route 3 Brook	
	Existing	Resulting	Existing	Resulting	Existing	Resulting
Lead	0.03	0.030	0.02	0.021	0.02	0.022
Zinc	0.01	0.011	0.01	0.018	0.02	0.032
Iron	1.0	1.0	1.22	1.16*	0.87	0.82*
Cadmium	0.006	0.006	0.005	0.007	0.005	0.009
Total Nitrogen	0.02	0.025	0.035	0.079	0.04	0.115
Total Phosphorus	0.085	0.085	0.134	0.133	0.03	0.040
Chloride	9.6	10.2	7.5	12.6	115.0	111.0**

* Reduced concentrations are shown because iron is generally more common in winter runoff.

** A reduction of the non-winter chloride level at this location is attributable to the high existing concentration.

EXISTING AND RESULTING CONCENTRATIONS — ONE-YEAR THIRTY-MINUTE STORM IN 7Q10 FLOW OVER ONE DAY

	Discharge 1		Discharge 2		Discharge 3	
	Winnetuxet River		Annasnappet Brook		Route 3 Brook	
	Existing	Resulting	Existing	Resulting	Existing	Resulting
Lead	0.03	0.033	0.02	0.048	0.02	0.09
Zinc	0.01.	0.023	0.01	0.086	0.02	0.122
Iron	1.00	0.99	1.22	1.30	0.87	1.03
Cadmium	0.006	0.009	0.005	0.016	0.005	0.020
Total Nitrogen	0.02	0.075	0.035	0.325	0.04	0.420
Total Phosphorus	0.085	0.107	0.134	0.278	0.03	0.260
Chloride	9.6	14.3	7.5	31.5	115.0	62.0

Mr. Norman J. Van Ness
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discharge must be assured, otherwise collection of a greater volume (although of equal concentration) could cause an increased impact to the groundwater quality at the discharge location possibly even more severe than if allowed to discharge near the well field.

It would be appropriate for the Final EIS to address the various water quality impacts of discharging a closed drainage collection network to the land, stream (for quick dilution and removal from the watershed), and retention or storage basins.

Alternative number 7 (Corridor 4-M) passes a potential Kingston municipal supply well located in the eastern portion of the corridor, south of Smithe Lane. This well site which is approximately 1000 feet upgradient of the alternative's southern right-of-way, may have become operational in 1978. The EIS should state the present operational status of this well. The potential impacts of the proposed highway on the well field under pumping conditions should be evaluated. 35

The impact analysis of the proposed highway on all potential well fields should evaluate both ambient and pump conditions.

B. WETLANDS IMPACTS

The implementation of a relocated U.S. Route 44 will result in the irreversible and irretrievable commitment of 34 to 41 acres of wetlands. The loss of these viable wetlands cannot be justified by the use of percentage comparisons to the total wetland acreage contained within the region. Instead, the impacts of the loss of these specific wetlands should be weighed against the impacts of alternatives with various mitigating measures in making the final decision. Mitigation could include measures such as: shifting the alignment within the corridor to avoid wetlands altogether; terracing; use of divider or reduced median strip; elevated roadways, viaduct; bridges; construction on piling; reduction of fill areas; special drainage collection, storage and discharge systems; and best available construction techniques. Priority should be given to maintaining water circulation patterns, existing patterns of vegetation and ecology, and minimizing fill activities. 36

The Draft EIS states "In the Plymouth Master Plan (1966) it (relocated U.S. Route 44) was located along the abandoned railroad right-of-way which is north of existing Route 44 and terminated at route 80 in that town." (page 11) The EIS should evaluate this alignment as a possible alternative or at least elaborate on why the abandoned railroad right-of-way is no longer a feasible alternative. The implementation of a railroad alignment could possibly minimize the impact to wetlands. 37

ultimately discharged to the receiving waters. They will be sized to be able to handle runoff from the 25-year storm event of 4.3 inches. (By comparison, the low-flow, intense-storm impact analysis used the one-year, thirty-minute storm of 0.8 inches.) During low-flow periods the basins will capture and retain runoff from most storm events and allow pollutants to settle. In this way, runoff will be prevented from entering the receiving streams until sediment-associated pollutants have had a chance to settle and the remaining water is diluted by runoff from a large rainfall event or series of events.

35 The Town of Kingston currently maintains a well at Grassy Hole which has a sustained yield of approximately 1.2 million gallons per day. An additional well is being considered to be southwest of this well site. Water quality from the Grassy Hole well is presently good. The preferred Alternative 4-M-5 is located approximately 4,000 feet to the south of the proposed well. Route 3 is situated approximately 1500 feet to the northeast of Grassy Hole. 4-M-5 should present no potential for impacts to the quality of water from this location as it will be located beyojnd the area of influence, and will drain into a closed system downstream of the area of influence.

Well fields have been proposed, or are being considered by the Towns of Kingston and Plympton at various locations within the vicinity of 4-M-5. At each of these locations the existing water quality is suitable for potable use.

The Town of Kingston has identified potential well sites at Grassy Hole, Muddy Pond, and Trackle Pond. For either site under ambient or pump conditions, the impacts on groundwater conditions will be the same. Due to the use of a closed drainage system, there will be no discharge of roadway runoff in the vicinity of these wells. Therefore, there is no potential for the draining of contaminants into the aquifer under pump conditions.

The potential well site which has been identified in the Town of Plympton is located approximately 4,000 ft. downstream of discharge point #2. Under ambient conditions there should be limited impacts to groundwater quality as any potential contaminants will be diluted and carried into the Winnetuxet River. Private wells in this area are of insufficient yield to induce recharge from the stream. A large capacity municipal well at this location, however, could induce recharge under low flow conditions, which may result in elevated levels of sodium and chloride in the groundwater.

36. An evaluation of wetland-related impacts based on the commitment to implement all practicable mitigation measures is provided in the Final EIS. Each of the measures cited above is addressed and those considered practicable identified. Narrowing the roadway median to 60 ft., for example, has been incorporated into project design. Impacts to wetlands, as indicated in Section 4 of the Final EIS, are thus evaluated based on the implementation of proposed mitigation measures.

Mr. Norman J. Van Ness
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The Final EIS must address the special construction techniques and shifts in highway alignment to be implemented during the construction phase of the project. The impact these mitigation measures will have in minimizing the environmental impact of the project should also be addressed in the EIS. 38

Any cost-effective analysis between special mitigating construction techniques and normal construction procedures (i.e., elevated crossing versus a fill embankment) must consider the environmental benefit to be gained. A specific dollar value should not be tied onto environmental value. An analysis based strictly on monetary cost difference could rule out mitigation. Each environmentally sensitive area should be evaluated on a case-by-case basis.

C. AIR QUALITY IMPACTS

We concur with the Massachusetts Department of Environmental Quality Engineering comment letter of June 14, 1979 addressed to Mr. J. Radlo, Chief Engineer for Massachusetts Department of Public Works concerning the proposed U.S. Route 44 Expansion. The following air quality comments should also be addressed by the Final EIS:

- This project should be part of an areawide transportation plan established by both transportation and air quality control agencies. The Final EIS should document the coordination among the local, regional and state transportation planning and air quality agencies. Additionally, according to 23 CFR 770.205, the Final EIS must contain documentation of the Massachusetts Department of Public Works consultation with the Massachusetts Department of Environmental Quality Engineering over the issue of consistency of this transportation project with the State Implementation Plan (SIP). 39

- In order to be consistent with the SIP, mitigating measures such as commuter parking lots and bus/carpool lanes which will discourage induced VMT growth in the proposed project and thereby reduce hydrocarbon emission should be considered, discussed in the EIS, and included in the design of this proposed highway project, if practicable.

- Supply the input data for Caline-2 and the title of EPA guideline on which the conversion of 1-hour to 8-hour CO concentrations are based. 40

37. The railroad right of way referred to in the DEIS was the former Plymouth & Middleborough branch of the Old Colony Railroad, later the New York, New Haven and Hartford. When the line was abandoned many years ago, the land in the right of way was sold to abutting properties, adjoining subdivisions and to public agencies. It was considered as a possible corridor, but it was rejected because it traversed an area which by that time was too densely built up.

38. Special construction techniques, localized alignment modifications within the right of way, and other wetland-related mitigation measures are discussed in Section 4 of the Final EIS. As indicated in an earlier response, an evaluation of wetland impacts based on the implementation of these measures is also provided.

The commitment to those mitigation measures to be implemented with respect to Alternative 4M5 is not based exclusively on an analysis of cost differentials between "special" and "normal" construction procedures. Rather, wetland-related mitigation measures were selected based on their effectiveness in reducing impacts to wetlands, as well as the overall value of individual wetlands potentially subject to "special" construction techniques.

39. As stated in the Final EIS, this project is in an air quality nonattainment area which has transportation control measures in the State Implementation Plan (SIP) which was approved by the Environmental Protection Agency. The FHWA has determined that both the transportation plan and the transportation improvement program conform to the SIP. The Federal Highway Administration has also determined that this project is included in the transportation improvement program for the Southeastern Regional Planning and Economic Development District. Therefore, pursuant to 23 CFR 770, this project conforms to the SIP.

40. Title of EPA guideline on which the conversion from 1-hour to 8-hour CO concentrations are based:

U.S. Environmental Protection Agency, Guidelines for Air Quality Maintenance Planning and Analysis, Volume 9 (Revised): Evaluating Indirect Sources, Office of Air Quality Planning Standards, Research Triangle Park, N.C., September 1978.

This is Reference 4 in Appendix D (Air Quality) of the U.S. Route 44 DEIS.

Caline 3, the updated version of Caline 2, was used to derive the CO concentrations for all Alternatives. The inputs to Caline 3 have been sent to EPA under separate cover, and are also available upon request from the Mass. Dep't. of Public Works.

D. <u>NOISE IMPACTS</u>

A document entitled "A Design Noise Report" to be published by Massachusetts Department of Public Works on the proposed U.S. Route 44 Expansion is required to allow a thorough review of the noise area. Please forward a copy of the Design Noise Report for the project prior to or accompanying the Final EIS, so that we may evaluate the noise assessment. 41

Impacts of 5 to 15dB are very significant, especially in light of ongoing work by DOT and EPA to reduce motor vehicle and other noise levels in steps as small as 2 or 3dB. We recommend that noise abatement be considered in the Final EIS for all project locations with impacts above 5dB.

Thank you for the opportunity to review and comment on the Draft EIS. Please send five (5) copies of the Final EIS when it becomes available.

If you have any questions relative to our comments, please contact Donald Cooke on my staff at (617) 223-4635.

Sincerely,

Wallace E. Stickney

Wallace E. Stickney, P.E.
Director, Environmental & Economic Impact Office

Enclosure

41. A more detailed analysis of noise impacts along the selected alignment <u>is incorporated</u> in the final EIS. Any noise abatement measures to be included in the project are described in the Final EIS. A Design Noise Report is no longer required by the revised Federal Highway Administration (FHWA) noise regulations.

Noise abatement has been considered for this project in accordance with FHWA policy. That policy states that noise abatement should be considered when the predicted noise levels approach or exceed the FHWA noise abatement criteria (60 dBA for Category A and 70 dBA for Category B land use activities) or even predicted traffic noise levels substantially exceed the existing noise levels. We do not believe that a 5 dBA increase in existing noise levels would require consideration of noise abatement unless the FHWA noise abatement criteria are approached or exceeded.

EXPLANATION OF EPA RATING

Environmental Impact of the Action

LO -- Lack of Objections

EPA has no objections to the proposed action as described in the draft environmental impact statement; or suggests only minor changes in the proposed action.

ER -- Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating federal agency to reassess these aspects.

EU -- Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1 -- Adequate

The draft environmental impact statement sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 -- Insufficient Information

EPA believes that the draft environmental impact statement does not contain sufficient information to assess fully, the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft environmental impact statement.

Category 3 -- Inadequate

EPA believes that the draft environmental impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft environmental impact statement is assigned a Category 3, no rating will be made of the project or action; since a basis does not generally exist on which to make such a determination.

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Management
Leverett Saltonstall Building, Government Center
100 Cambridge Street, Boston 02202

LIAM F. M. HICKS
COMMISSIONER

CHIEF ENGINEER
RECEIVED
NOV 12 1981

October 28, 1981

Justin L. Radlow
Chief Engineer
Department of Public Works
100 Nashua St.
Boston, MA 02114

Re: Proposed Route 44 relocation,
Kingston, MA.

Dear Mr. Radlow:

I am writing as a result of a recent meeting between Massachusetts Natural Heritage Program (MNHP) staff and Department of Public Works personnel to discuss the proposed rerouting of Route 44, in Kingston. On September 11, 1981 John Feingold, Program Coordinator of MNHP, met with DPW's Rt. 44 project manager Gregory Prendergast to brief him on potential rare species conflicts in the Muddy Pond area. These conflicts had previously been discussed with Mr. Hartley, Mr. Prendergast's predecessor. After a review of its ongoing inventory of the state's rarest and most endangered species and ecological features, MNHP has identified Muddy Pond as one of ten ecological sites in Massachusetts deserving highest priority for protection. On the basis of this designation, The Nature Conservancy, a national land conservation organization, is studying Muddy Pond to develop an appropriate preservation strategy. Eve Endicott, Director of the Conservancy's New England Field Office, was also present at the meeting.

As you may know, the preferred alignment for Route 44, "4-M," may have adverse impacts on the world's largest population of _Eupatorium leucolepis_ var. _novae-angliae_ (White-Bracted Boneset.) This rare plant's range is restricted to a few sites in Rhode Island and southeastern Massachusetts, with about 60% of its known global population located along the eastern shores of Muddy Pond. _E. leucolepis_ var. _novae-angliae_ was cited in the December 15, 1980 Federal Register as a taxon with first priority for proposed federal listing under the Endangered Species Act of 1973. DPW and MNHP staff have been working together since December, 1980 to try to incorporate this rare species' protection into the planning for Rt. 44.

The 4-M alignment as shown in the Draft Environmental Impact Report was field-checked by MNHP staff on March 26, 1981, raising several concerns. First, the proposed route would go through, or very close to, a pondlet just northeast of Muddy Pond. This pondlet appears to have direct groundwater connection with Muddy Pond, and is also one of two local sites for _Psilocarya scirpoides_, a rare species of Bald Rush. Secondly, the topography along 4-M may provide visual access to the pond shores where _E. leucolepis_ grows. Thirdly, the topography would direct drainage from the proposed highway site towards Muddy Pond.

At the recent meeting with Mr. Prendergast, several specific recommendations to address these concerns and to protect E. leucolepis and P. scirpoides were discussed. These included: 1) To prevent groundwater contamination impacts - The 4-M alignment should be moved farther north into the State Forest lands to avoid the adjacent pondlet entirely, if possible. Careful study of groundwater movement in the area should be made to ascertain the effects on Muddy Pond of disturbance of the adjacent pondlot. 2) To prevent surface-runoff contamination impacts - Closed drainage should be provided along the section of highway north of Muddy Pond and the pondlet, to contain traffic wastes, road salt, and stormwater runoff. 3) To minimize physical and visual access - Vegetative screening should be maintained thus discouraging passers-by from increasing the use of the site. These concerns should be reflected in the scope and recommendations of the Final Environmental Impact Report. The Natural Heritage Program would be pleased to meet with you or your staff to discuss the recommendations for the protection of the rare species in further detail. 42

The development of regular coordination of MNHP with the DPW planning process was also discussed at the September 11 meeting. Early access to the Heritage Program data base, which is the only current and increasing statewide inventory of rare plants, animals, and significant ecological features, could be valuable to highwayplanners and ultimately yield substantial savings in staff time and money. The Program presently has over 2500 rare element occurrences mapped and cross-referenced in computer and manual files, the computer portion of which DPW has maintained until recently. Copies of this letter are being sent to MEPA, the Division of Forests and Parks, and the Federal Highway Administration with a request for MNHP to be included on appropriate "early coordination" mailing lists.

The Department of Environmental Management and DPW have been cooperating throughout the planning process to determine equitable compensation for DEM lands. In a letter on May 7, 1980 to DPW, former Commissioner Richard Kendall described the potential net acreage loss to Kingston State Forest from the proposed rerouting of Route 44. Please note that DEM's willingness to consider an incursion into the State Forest will be contingent upon protection of Muddy Pond and its rare species populations. Based on these considerations, we will be prepared at some future appropriate time to enter into an agreement with your Department concerning the compensating lands which will be added to the state forest and park systems as a result of the relocation of Rt. 44.

We appreciate the opportunity to be of service in this planning process and hope such cooperation will continue in the future. Please do not hesitate to call us if you have any questions.

Yours Sincerely,

William F. M. Hicks

William F. M. Hicks
Commissioner, DEM

cc: Sam Mygatt, MEPA Unit
Gilbert Bliss, Division of Forests and Parks
Norman Van Ness, Federal Highway Administration
Frank Bracaglia, Staff Specialist for Environment, FHWA
William Ashe, U.S. Fish and Wildlife Service
WFM/ASF/esf

42. Alternative 4M5 is located farther north, thus avoiding Muddy Pond and associated wetlands. In addition, roadway runoff will be directed from the Muddy Pond area via a closed drainage system. Consequently, impacts to Muddy Pond and associated groundwater resources will be limited.

A closed drainage system is planned for the entire length of the project. Traffic waste, road salt, and roadway runoff from the section of highway north of Muddy Pond will enter this system. The discharge point for this roadway section is at Annasnappet Brook.

DEPARTMENT OF TRANSPORTATION
OFFICE OF THE SECRETARY

UNITED STATES GOVERNMENT

memorandum

Subject: Draft EIS/Section 4(f) Determination: Massachusetts, US 44 from Route 58 to Route 3, FHWA-MASS-EIS-78-3-D

Date: 5 JUL 1979

From: Director, Office of Environment and Safety

Reply to Attn. of:

To: Chief, Environmental Programs Division FHWA/HEV-10

We appreciate the opportunity to review and comment on this draft environmental impact statement/section 4(f) determination.

We note that any of the construction would have impacts on wetlands areas in the corridor. The statement (page 80) suggests that these impacts will not be serious because of the abundance of wetlands in the area. Executive Order 11990 is intended to prevent the continuing small scale attrition of the nation's wetlands areas, attrition which has had serious cumulative impacts over the past several decades. Therefore, to comply with the Executive Order, plans for Route 44 should reflect every reasonable effort to avoid wetlands, and the final EIS should include commitments to specific measures to minimize wetlands impacts. 43

We look forward to receiving the final EIS, including the comments received from other public agencies and the general public on the draft statement.

Martin Convisser

SPEED LIMIT 55
It's a law we can live with.

43. Section 4, Subsection 1 of the Final EIS discusses the proposed measures to minimize impacts on wetlands.

TOWN OF KINGSTON, MASSACHUSETTS

Office of

THE SELECTMEN

TELEPHONE [illegible]

REGULAR MEETINGS

TUESDAY 7:15 P.M.

August 25, 1978

Robert T. Tierney, P.E.
Chief Engineer
Department of Public Works
Commonwealth of Massachusetts
100 Nashua Street
Boston, Massachusetts 02114

Dear Mr. Tierney:

Please be advised that the Board of Selectmen has jurisdiction over the section of Kingston known as Camp NeKon by virtue of townmeeting action.

For the purpose of Section 138, of Title 23, and Section 4f of the 1966 Dot Act, we feel that the area known as Camp NeKon is significant because the area under consideration has been purchased specifically for park, recreation, and conservation purposes as well as for the maintenance of a wildlife preserve. Attached as Appendix A is a map defining the various public uses of Camp NeKon property. We feel, also, that contiguous areas in the southwest part of Kingston, although not town owned, are significant in terms of the Section 4f statement.

Various town agencies have spent many months evaluating the Camp NeKon area and contiguous parcels in view of this statement requirement. Obviously, a proper and complete impact statement cannot be submitted at this time because time restrictions prevent us from doing migratory studies during migratory seasons, etc. We have, however, spent as much time as we could be allowed by your Department to gather as many facts as possible.

Camp NeKon was purchased by the town, solely with town funds, from the Plymouth Bay Girl Scout Council in 1975 for the purpose of implementing the town's master plan as it pertains to land use, maintenance of open spaces, and the protection of natural resources. The philosophy guiding the development of our town's master plan that "recreation and open space should be regarded not as a luxury, but as a necessity...such lands are necessary to preserve the balance of nature...to reserve desirable natural features...to protect essential water resources...." still guides our town's planners and officials.

The Commonwealth has submitted several alternatives for the relocation of Route 44. Not all proposals bisect Camp NeKon: therefore, it appears obvious that the Commonwealth cannot determine, as required under paragraph a of Section 4f, "that there are no feasible and prudent alternatives to the use of land from a publicly owned park, recreation area, or wildlife and waterfowl refuge of national. State or local significance." 44.

The Board fears that the construction of a limited-access highway will slow down the response of fire apparatus responding to possible forest fires in this area. All of the town's firefighting equipment is stationed north of this proposed route. Similarly, police and medical response will have the same slow-down increasing the liklihood of vandalism and serious accidents in this wildlife and recreation area. 45.

The Board fears the construction of this highway along the proposed route will bring ecologic damage along this entire route, thereby further reducing contiguous supporting food areas for wildlife and other ecological features essential to the delicate balance of nature.

Camp NeKon includes Smelt Pond and we have had reported to us the existence in this location of the Purple Gentian, a plant presently on the endangered specie list and of the red-bellied turtle, presently being considered for such listing ~~by the Secretary of the Interior. The Board of~~ Selectmen are on record as supporting the classification of this diminishing specie of reptile as an endangered specie. We have noted the nesting and feeding of many other non-endangered species of song birds and waterfowl at Camp NeKon as well as a profusion of wild plants, many indigenous only to wetland areas and depended upon by certain species of waterfowl. 46.

The Board of Selectmen regard this area as a peripheral watershed area and further note its inclusion on the flood plain maps of the Department of Housing and Development. 47.

All of the concerns entertained and expressed by the town in relation to the Camp NeKon area also apply to those areas of Kingston surrounding and including Muddy, Treacle, and Pratt Ponds. The Board of Water Commissioners have expressed their special concern about any road construction in the area of Treacle Pond where two well sites are proposed.

To avoid redundancy, we have enclosed as appendices statements by the Sisters of Divine Providence who own extensive lands at Muddy Pond as well as by the Town's Conservation Commission and Camp NeKon Committee with which we are in agreement.

The Board of Selectmen urge that a negative determination be rendered for this highly controversial route alternate. The Board of Selectmen reiterates its opposition to any construction of Route 44 through the Town of Kingston because of the foregoing environmental concerns as well as for the reason it promises no economic growth or development of the area. We understand that the road does make such a promise to the Town of Plymouth, of Carver, and of Plympton, and we do not object to their development or growth. We do request, however, that the road be laid out so as to be completely contained within those towns that seek its benefit. Such an alternate has been proposed by the Commonwealth's engineering consultants. Another is marked in blue on our Appendix A. 48.

44. No proposed Alternative bisected Camp Nekon. Alternative 4-M-5 crosses Camp Nekon at two locations, both at the southern extremity-one at the west end and one at the east end. See Section 5-4 "Effects of Project on Section 4(f) Land" and Section 5-7 "Conclusion".

45. All of the land in Camp Nekon, except for one half/acre parcel at the east end that Kingston has agreed to transfer to the Sisters of Divine Providence, will be situated north of the proposed highway. No known roadways are severed by the proposed highway that would prevent the Kingston Police or Fire Departments from responding to an emergency in this wild life and recreation area. The area of Kingston south of the proposed highway can be reached via Route 44 to the Connector Road to Route 80. Also, mutual aid assistance from Plymouth is available.

46. The Department of Public Works has coordinated its efforts with the Executive Office of Environmental Affairs-Department of Environmental Management and the Massachusetts Natural Heritage Program to ensure that an alignment was selected that would not affect any rare or endangered species. The U.S. Department of Interior, Fish and Wildlife Service, has also reviewed the proposed alignment for any impact to rare or endanged species, and has concurred that there is no impact. See FIGURE 5-3-16. Smelt Pond is located along the eastern edge of Camp Nekon and is approximately 2,400 feet northwesterly of the proposed highway.

47. Map 4-I indicates that Smelt Pond is a potential Flood Hazard Area. The proposed highway is 2,400 feet away from Smelt Pond. It is also about 1,000 feet from the proposed well site at Trackle Pond and about 800 feet from the proposed well site at Muddy Pond. The proposed closed drainage system will carry all roadway runoff away from the proposed well sites, thereby protecting them from any roadway pollution.

48. At the request of the Sisters of Divine Providence to have the proposed highway moved in a northerly direction away from Muddy Pond, the Kingston Selectmen stated that they would not oppose the Sisters' proposal for a realignment of a portion of the proposed highway further into Kingston. This realignment required the taking of the two small parcels of Camp Nekon land.

The Department of Public Works is not aware of any proposed Alternative that did not go through a portion of Kingston.

The only plan in the administrative record with an alignment marked in blue is a plan submitted by Kingston showing the different sections of Camp Nekon in various colors. It also shows a modified 4-L alignment that is still in part of Kingston in the vicinity of Parting Ways Road.

x

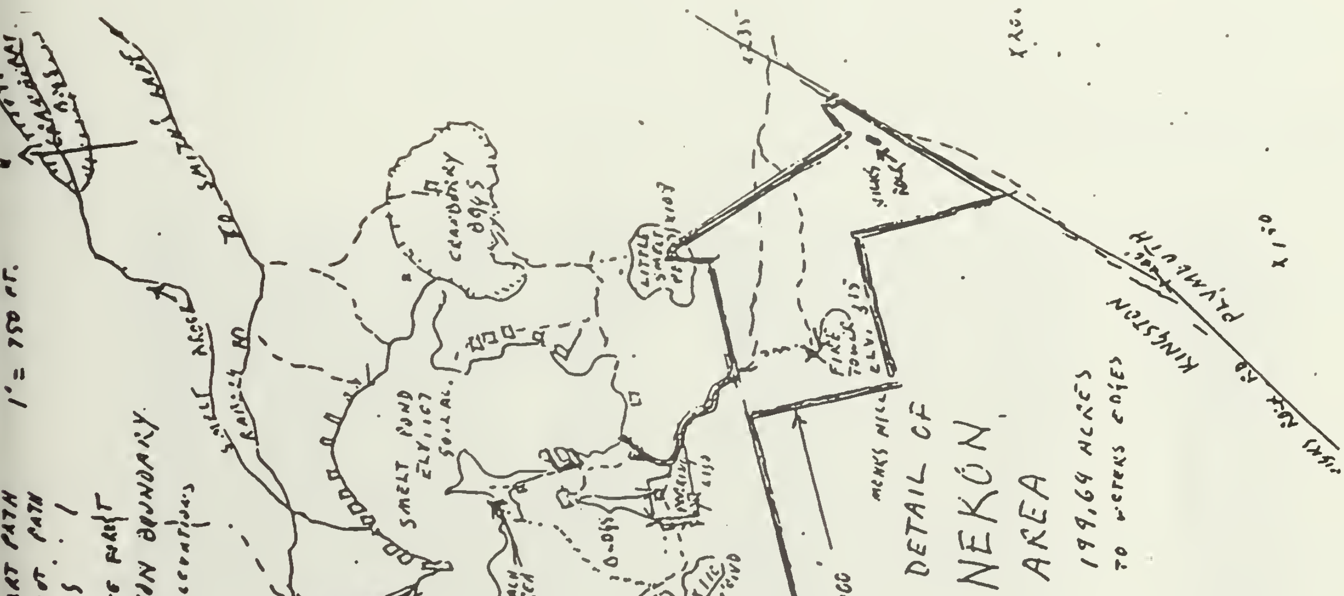
The Board of Selectmen have attended and conducted several meetings in regards to Route 44 relocation over the past several years. At no meeting was any support voiced for Route 44 coming into Kingston. On the contrary, all elected and appointed officials, interested townspeople and officials of Sacred Heart School voiced their feelings loud and clear - "not in or through Kingston".

Sincerely yours,

Charles L. Farrington Jr.
Chairman

M/p

Enclosures



CART PATH
FOOT PATH
BUILDINGS
STATE PARK
NEKON BOUNDARY
SPOT ELEVATIONS
1' = 750 FT.
SMELT POND
CRANBERRY BOGS
BEACH AREA
ROCKY POND
3000
DETAIL OF
NEKON
AREA
199.64 ACRES
TO WATERS EDGES
KINGSTON
PLYMOUTH

Plymouth Planning Board

11 Lincoln Street
Plymouth, Massachusetts 02360
617 · 747-1620

June 14, 1979

Justin L. Radlo
Chief Engineer
Mass. Dept. of Public Works
100 Nashua Street
Boston, MA 02114

Re: Route 44

Dear Mr. Radlo:

The Planning Board has discussed the draft Impact Statement concerning Route 44 and has the following recommendations to make:

1. The need for improved east-west access in the area is significant. The Board does not support alternatives 1, 2, or 3 because it feels that:

    1. We cannot do nothing;
    2. Improvement of the existing Route will not solve the problem and will be too disruptive to the people living along the road.
    3. Partial relocation suffers from the same problems as the upgrade of the existing Route: it will not solve the problem and will be too disruptive to the neighborhood.

2. While the Board feels that, of the various full relocation alternatives, alignment 4-N, which intersects Route 3 at Smith's Lane is most preferable to Plymouth, the Board has voted concurrence with the Selectmen's feeling that 4M and 4M-1 alignments are appropriate compromises between 4L, which is abhorrent to Plymouth, and 4N, which is opposed by Kingston. The Board notes that on page 43, the consultant states that improvements to Route 44 from Route 80 to Route 3 and a major modification of the Route 3/Route 44 Interchange is necessary with all alignments. The Board agrees that these improvements are absolutely essential to any improvements. They should be raised to top priority and no contract let without their inclusion in it. 49.

3. The Board feels that alignments 4M-1 and 4M are compromise alignments and can be further improved as follows:

    A. <u>Visual Impact at Route 3</u>: The intersection of Route 44 and Route 3 at Cherry Street could be a major blot on Plymouth's landscape, 50. particularly undesireable because of its location at Plymouth's

49. The Town of Plymouth is currently studying the improvement of Route 44 from Route 80 to just east of Route 3. The proposed improvements would conist of widening the existing roadway and adding left turn storage lanes where warranted.

The Massachusetts Department of Public Works will consider funding the construction of these improvements at a future date. The Town of Plymouth has indicated that they will fund the design and the associated costs for right of way acquisition. These improvements from Route 80 to Route 3 would be constructed under a separate contract other than the new Route 44 construction contract.

The Route 3/Route 44 (Samoset Street) interchange will be improved as part of the new Route 44 construction contract.

50. There is a high water table in the Cherry Street area. If Route 44 were to be constructed under Route 3, then the elevation of Route 44 would have to be approximately the same as existing Cherry Street. The profile of Route 3 would then have to be raised to attain the required clearance between Route 44 and Route 3. This would necessitate complete reconstruction of a portion of Route 3 while maintaining existing traffic flow. Also, more land takings would have been required with the Route 44 under Route 3 scheme. Therefore the Route 3/Route 44 (Cherry Street) interchange was designed to have Route 44 overpass Route 3.

The Route 3/Route 44 (Samoset Street) interchange will be improved as part of the new Route 44 construction contract.

'Entrance'. Relocated Route 44 must go under Route 3, just as Cherry Street does now.

B. Access to Historic Plymouth: In as much as Route 44 is intended to service economic development and tourism is clearly a major economic force in Plymouth, a solution to the problem of access into Plymouth must be found and agreed upon prior to Route 44's commencement. To do otherwise would do no more than to rearrange the problem a little bit, probably to the detriment of the residents of Cherry Street. Without endorsing the Route of the proposed shuttle system, the Board feels that a Visitor's Center should be designed and constructed along with Route 44. 51.

C. Improve Route 3/44 Interchange: As with '4N', the present Route 44 must be upgraded and the Interchange improved. The Board suggests that this be carefully sequenced with the relocation. The Interchange should be improved immediately (timed to minimize impact on tourism), with Route 44 upgraded only after Route 80 and Route 44 from 80 to 3 is complete to serve as an alternate access. 52.

4. Having endorsed the compromise alignments, the Board wishes to point out that there are a number of specific aspects of the impact of the 4L alignment which are unique to it, and which can only be avoided by selecting a different alignment. 53.

Parting Ways:

Like Plymouth Rock, the Mayflower II and the Plimoth Plantation, Parting Ways is of national significance now, even though its full significance is still unknown. A prime benefit of Route 44 is its access to "The Historic Center of Plymouth". The 4 (F) Statement says that the impact of Corrider 4L on Parting Ways will be minimal and goes on to state that the actual importance of the 23 acres which will be affected is not known. We feel that the loss of roughly 22% of an historic site of national significance (it is now on the National Register) is not 'minimal'. Further, in all of the other cases of takings, there appears to be nothing unique about the land taken and replacement appears possible. Such is not the case with Parting Ways. The land may very well have unique physical evidence of historical events of national importance.

An additional impact occurs when the proposed museum facility is considered on the present Parting Ways site. That is the effect the 4L alignment has on the access to the museum. The presence of the relocated 44 coupled with a re-alignment of Route 80 makes for a very convoluted Route for tourists seeking Parting Ways.

Industrial Land:

Alignment 4L effectively isolates an area of land presently zoned for light industry lying between the proposed R.O.W. and the Plymouth-Kingston Town line. The area of this land is roughly 130 acres. Its development with

51. A Visitor's Center on Long Pond Road in Plymouth, just off Route 3, was opened September, 1985.

52. See Response #49 above.

53. Alternative 4-M-5 is the chosen alignment.

alignment 4L necessitates a cul-de-sac almost a mile in length. Current Town regulations prohibit cul-de-sacs of more than 500' for safety reasons. The 4L alignment will greatly reduce the usefulness and value of this property for economic development, another primary objective of Route 44. 4L also requires the taking of an additional 75 acres of industrially-zoned land, thus reducing the total area available for economic development.

Housing:

As Section 'F' shows, alignment 4L will be elevated in the vicinity of housing on and near Route 80 in Plymouth. Concern has been voiced by residents in the area that the visual impact of the road on their homes and property would diminish their values especially in view of the otherwise (and highly desireable) rural character of the area. Although the report asserts (p. 59) that no structures will be affected in Plymouth by the takings for alignment 4L, that is only true in a very limited sense. As figure 4 (F)-4 shows, several houses in Plymouth will be immediately adjacent to the right-of-way (one appears to lose land to the R.O.W.). It appears from the section and plan, that the road will at least be in full view of these and many more homes in the development, behind them.

In addition, the noise impact of 4L on the homes in Plymouth may be more significant than is shown as no sampling site close to the road was chosen in the area.

Route 80 and Charlotte Drive:

The traffic volume diagrams (figures 15 through 19) indicate that all of the full relocation alternatives will result in a great increase of traffic on Route 80 by the year 2000.

We feel that the impact of 4L on Charlotte Drive in Plymouth will also be substantial and should be included in the analysis. Charlotte Drive is located roughly 1/2 mile west of the portion of '3E' running between Route 44 and Route 80. It is roughly parallel to it and would appear to be an alternative route for traffic coming from the west heading for relocated Route 44 especially alignment 4L. Figure 16, indicates that the volume of traffic which would opt for such an alternate route would be almost 3000 ADT by the year 2000. This is equivalent to the traffic on Carver Road between Route 44 and Summer Street today. Figure 22 shows that the accident rate on this road was the third highest of the links considered in 1973, and second highest in 1974. Charlotte Drive is quite similar in alignment and number of driveways to this section of Carver Road.

While it is not clear that Charlotte Drive would be subject to the same volume of traffic as the '3E' alignment it seems very likely that it would be subject to a substantial increase in traffic, for which it was not designed. The increase would probably be proportional to the

proximity of relocated Route 44, with alternate 4L resulting in by far the largest increase. Again this would very seriously and directly impact all of the residents of Charlotte Drive in a negative way. The Town of Plymouth feels that the impact on Charlotte Drive should be analyzed and avoided by selecting a route other than 4L.

Water:

It is readily apparent that the impact of alternate 4L on Plymouth's present and future water supply could be significant. It is unclear that this negative impact can be mitigated and is another argument against this alternate.

Scheduling and Cost:

Beyond the specific physical impact of 4L, there are two other considerations; cost and timing. The cost of 4L is greater than 4M-1 by over 2 million dollars or 7.5%. That cost apparently does not include the costs of the necessary and probably extensive and perhaps expensive archaeological investigations required. Those investigations will very likely also require a significant amount of time and add to the delay in effecting the relocation, and the construction of the already long overdue improvements.

Yours truly,

PLYMOUTH PLANNING BOARD

Louis J. Cotti, Jr.

Louis J. Cotti, Jr.
Chairman

LJC/e

cc: Selectmen

SRPEDD SOUTHEASTERN REGIONAL PLANNING AND ECONOMIC DEVELOPMENT DISTRICT
MARION, MASSACHUSETTS 02738, Tel. (617) 748-2100

July 16, 1979

Mr. Fraser Hartley
Mass. Dept. of Public Works
100 Nashua Street
Boston, MA 02114

Dear Mr. Hartley:

We are taking this opportunity to comment on the Draft Environmental Impact Statement (DEIS) and Section 4(f) Document for Route 44 between Route 58 in Carver and Route 3 in Plymouth. The SRPEDD Commission has been a long-standing proponent of an improved Route 44 along its entire length from Plymouth to Rhode Island. The section which is the subject of the aforementioned DEIS is of particular concern as it serves one of the State's Economic Growth Centers. We concur with the DEIS finding that improvement of this roadway is necessary as a means for providing an adequate westward mobility for the Growth Center's commercial and industrial residents.

Based on information contained in the DEIS, statements made by public officials and local residents at several public meetings held during the preparation of the subject document, and the public positions of SRPEDD constituent municipalities (notably Carver and Plympton), we urge strong consideration of the construction of a full route relocation alternative. In particular, it appears that the preferred alternative from our standpoint is 4-M-1, notably because it directly serves the Plympton Industrial Area thereby providing a significant access improvement to regional commercial and industrial firms. We feel that it is of primary concern that the economic growth incentives provided by any chosen alternative be weighed heavily in the selection process as this has been a primary goal in the development of this subject. 54.

SRPEDD's Regional Transportation Plan recommends upgrading Route 44 from two to four lanes along its entire length (including relocation where necessary, i.e. Taunton and Carver-Plympton segments), from Rhode Island to Plymouth. The DEIS recommends construction of a two-lane facility to be upgraded to four lanes at such time as additional traffic volume warrants. We concur with this recommendation for the proposed full relocation alternative. However, we feel that the recommended 400' right-of-way acquisition is excessive. The roadway specifications presented on pages 51-52 of the DEIS could be easily met with a 300' right-of-way. It does not appear that unwanted scenic intrusions nor additional negative environmental impacts would occur as a result of the suggested narrower right-of-way, and it is readily apparent that the environmental and social impacts of land acquisition, highway construction and operation would be less severe 55.

54. The chosen alignment is 4-M-5, which is a modification of 4-M-1.

55. Although projected traffic volumes do not warrant a 4-lane divided highway in the design year, they will approach the volumes that do dictate such a highway. To avoid the disruption from a second construction period and in the interests of safety, the Department of Public Works has decided to build a 4-lane divided highway.

The 400' right of way is required in areas of deep cuts. It will also provide a greenbelt along the highway that will prevent developers from building right up to the highway.

The construction of a full route relocation alternative is apparently not the entire solution to traffic problems in the area. Though outside the scope of SRPEDD's jurisdiction, there are two questions which we feel need attention. First, traffic volume projections, presented in the DEIS for all alternatives, indicate that the eastern end of the present Route 44 in Plymouth will continue to carry significant traffic volumes regardless of the choice of full relocation alternative. This portends the continuation of a local traffic problem due to the extensive commercial development already present in that location and the continued demand generated by that development. Secondly, the volume projections for Route 3 raise the question of the ability of that roadway to serve 50% or more vehicles than it presently carries, particularly as that volume moves northward to more congested sections of that facility. 56.

We appreciate the opportunity to comment on the DEIS, and will continue to provide whatever support is necessary to insure the continued forward progress of this venture.

Sincerely,

William D. Toole
Executive Director

DAW:WDT:spg

56. The eastern end of existing Route 44 will continue to carry significant traffic volumes which will increase as development along the highway continues. The proposed improvement to the Route3/Route 44 (Samoset Street) interchange will accommodate some of the growth. The Town of Plymouth is studying the upgrading of Route 44 from Route 80 to just east of Route 3, consisting of widening the existing roadway and adding left turn storage lanes where warranted.

The Department of Public Works is developing a lane addition project which will provide six lanes on Route 3 from Route 128 in Braintree to just south of Route 139 in Duxbury. The six lane facility will be adequate to carry the increase in traffic from Route 44.

Old Colony Planning Council

Regional Planning Agency

Gerard W. Dempsey
President

Daniel M. Crane
Executive Director

232 Main Street,
Brockton, Massachusetts, 02401
Phone: 617-583-1833

June 8, 1979

Mr. Justin Radlo
Chief Engineer
MDPW
100 Nashua Street
Boston, MA 02114

Dear Mr. Radlo:

The staff of the Old Colony Planning Council is pleased that the Environmental Impact Study process is nearly over. We also wish to commend the Department and its consultant for the hard work they have performed in identifying and examining so many important issues.

We would also at this time like to restate the Council's formal position that a full route relocation of Route 44 is needed to meet the anticipated traffic demands of the years to come and to serve to enhance the area's economic development by providing it with a transportation link to the markets to the west. The Council has opposed Route 4-N however because it poorly serves the anticipated demands and because it causes major disruptions to the economic development of the Kingston Industrial Park at Smith's Lane. 57.

Of the remaining full relocation alternatives the Council staff only wishes to state that while we are sure that the Department of Public Works will do its best to arrive at a fair and just selection we hope that the selection would be made with the utmost speed. The recent and rapid development in the study area has already made the selection process difficult and unless steps are taken to secure necessary rights-of-way soon and chance of completing this project at any future time will be virtually lost.

Sincerely,

Daniel M. Crane
Executive Director

DMC:DFB:jm

57. The chosen alignment is 4-M-5.

Town of Kingston, Massachusetts
Conservation Commission

August 18, 1978

Mr. Charles L. Farrington Jr., Chairman
Board of Selectmen
Town Hall
Kingston, Mass.

Dear Mr. Farrington:

The Conservation Commission is opposed to the proposed alternate "LM" relocation of Rt. 44. This route will have a detrimental affect on many species of wildlife and natural vegetation. The route passes near several ponds which are breeding grounds for waterfoul. Many different species of ducks use these ponds. There is a small flock of geese (Canada) which also use these ponds for breeding. It has been reported that Muddy Pond and Pratt's Pond are habitats for the Plymouth Red Bellied Turtle. This species of turtle is being added to the National Endangered Species list. The contamination and noise pollution generated by this road would drive the waterfoul and this species of turtle from this area. This area is one of the last natural breeding areas in the town. 58.

The Plymouth Gentian, a rare cosmos type aquatic plant with a pink flower, found only in a few ponds in the Plymouth area is growing in Muddy Pond. Muddy Pond is a spring fed pond with no inlet or outlet. It will be easily contaminated by the runoff from this road. Once the contaminants are introduced into the pond they will remain and destroy the water quality of the pond. The Plymouth Gentian will not survive in this type of water.

Muddy Pond is also used for recreational purposes, fishing, swimming, and boating. This pond is the recreational area for Camp Mishannock operated by the Sisters of Divine Providence. If this pond can no longer be used for this purpose the Sisters will have to close the camp creating a severe hardship to them. 59.

The Kingston Water Department has two well sites along this route. One at Trackle Pond and the other near Muddy Pond. These two well sites are of great value to the Town of Kingston as the entire water supply is derived from artesian wells. The contamination from road salts will limit their use as a water supply.

Very truly yours,

Dennis P. O'Brien
Chairman

58. The Department of Public Works has coordinated its efforts with the Executive Office of Environmental Affairs-Department of Environmental Management and the Massachusetts Natural Heritage Program (MNHP) to ensure that an alignment was selected that would not affect any rare or endangered species. The U. S. Department of Interior--Fish and Wildlife Division has also reviewed the proposed alignment for any impacts to rare or endangered species and has concurred that there is no impact. See FIGURE 5-3-16.

59. A closed drainage system will carry all roadway runoff away from Muddy Pond and Trackle Pond, thereby preventing any pollution to the nearby Town well sites. The proposed highway is approximately 1,000 feet from the proposed well site at Trackle Pond and 800 feet from the proposed well site at Muddy Pond.

TOWN OF KINGSTON, MASSACHUSETTS

Office of

THE SELECTMEN

TELEPHONE 585-4445

REGULAR MEETINGS

TUESDAY 7:15 P.M.

June 12, 1979

Justin Radlo, P.E.
Chief Engineer
Department of Public Works
Commonwealth of Massachusetts
100 Nashua Street
Boston, Massachusetts 02114

Dear Mr. Radlo:

The Town of Kingston has formally stated to the MDPW its objection to the relocation of Route 44 through the Town of Kingston. Once again we reiterate that objection.

We are vehemently opposed to the following alternate routes proposed by the MDPW and The Architects Collaborative: Alternate 4-N, Alternate 4-M1; 4-M, and Alternate 4-L.

We are opposed to Alternate 4-N because it bisects the town and threatens our Townspeoples' safety and because it presents a threat to 60.
the environmental situation occasioned by its nearness to the Town's landfill operation and water resources.

We are opposed to Alternate 4-M and 4-M1 because it bisecte the town and threatens our Townspeoples' safety and because it presents a threat to the environmental situation along the route which includes the State 61.
Forest, Camp Mishannock owned and operated by the Sisters of Divine Providence, the town-owned Camp NeKon, and proposed well sites in the area of Treacle Pond.

We are opposed to Alternate 4-L because of its bisection of the Parting Ways Cemetery, a site which the Federal Government has stated shall be preserved as a monument to our national heritage.

For the sake of brevity and to avoid redundancy we refer you to our letter of August 25, 1978, with its enclosures, for more and specific objections to the proposed routes. We beg you not to mistake our brevity for lack of resolve in objecting to these proposals.

60. The chosen alignment is 4-M-5.

61. 4-M-5 does not bisect Kingston. It crosses a small section of Kingston (approximately two miles in length) in the most southern section of the Town.

Land taken from Kingston State Forest and Camp Nekon will be replaced by the Department of Public Works.

The final alignment (4-M-5) was moved away from Camp Mishanock as a result of the request by the Sisters of Divine Providence and to protect an endangered plant species (white-bracted boneset). A closed drainage system will carry all roadway runoff away from Muddy Pond and Trackle Pond, thereby preventing any pollution to the nearby Town well sites. The proposed highway is approximately 1,000 feet from the proposed well site at Trackle Pond and 800 feet from the proposed well site at Muddy Pond.

Justin Radlo, P.E. -2- June 12, 1979

We applaud the intention of the MDPW to correct the traffic situation now existing on Route 44 and to develop a coordinated, two-fold program to encourage by this means the economic development of Carver, Plymouth and Plympton. We must now insist, however, as we have requested in the past, that the route be laid out so as to be completely contained within those towns that seek its benefit. 62.

We further insist that an alternate route be found that will avoid the alternatives which are not only of no value but also detrimental to the welfare of the Town of Kingston and its 6,776 residents. Such an alternate has been proposed by the Commonwealth's engineering consultants. Another alternate was proposed by our Town and submitted to you last August. We understand a third alternate, contained completely in Plymouth, was proposed as early as 1975 and is in the files of the Office of State Planning. We urge you to direct your energies more productively by assessing these three proposals and avoiding all others that lie within the Town of Kingston. 63.

Sincerely yours,

Richard A. Ottino
Chairman

RAO/p

Enclosures

62. The Department of Public Works has attempted to design an alignment that would have minimal impacts while satisfying the purpose and need of the project. One of the project objectives was to provide access to the three industrial parks in the area. A route that completely by-passed Kingston was not possible.

63. The only Alternatives that did not impact Kingston were the No-Build; Upgrade Existing Route and Partial Build: Corridors 3E & 3W. The Department of Public Works is not aware of any Full Route Relocation Alternative that did not go through a portion of Kingston.

At the request of the Sisters of Divine Providence to have the highway located further away from Muddy Pond, the Kingston Selectmen stated that they would not oppose the Sisters on their proposal for a realignment of a portion of the proposed highway further into Kingston. This realignment required the taking of two small parcels of Camp Nekon land.

BOARD OF SELECTMEN

POSITION PAPER: ROUTE 44 EIS

JUNE 6, 1979

he Town of Plymouth, acting through its Board of Selectmen, Planning Board and ther local agencies and commissions, has carefully studied the "Draft Environ-ental Impact Statement and Section 4 (f) Document" on U. S. Route 44. The own finds the need for an east-west corridor to be evident and well-documented. he economic development of Plymouth and surrounding communities is dependent pon an effective link to Routes 24, 25 and beyond. Traffic congestion, tourism nd evacuation operations all would benefit from the construction of a new Route 4.

hile the Town of Plymouth is indeed aware of the benefits of a relocation of oute 44, it is very careful to note that not all alternatives for it's relo-ation are acceptable to the Town. Alternative 1 (No Build), Alternative 2 Upgrade Existing Route) and Alternative 3 (corridors 3-E and 3-W) create ex- 64.
ensive disruption, relocation and environmental impact, while not, in the case of Alternative 1 and 2, servicing the need identified.

It is apparent that a full route relocation will be necessary to accomodate the economic development, tourism, traffic flow, and evacuation needs specified. Alternative 5 (corridor 4-M) and Alternative 6 (Corridor 4-M1) appear to the Town of Plymouth to be the soundest options available as outlined in the En-vironmental Impact Statement. While being "full route relocations" of Route 44, the environmental impact is minimized, the disruption and relocations reduced.

The Town of Plymouth is unalterably opposed to Alternative Corridor 4-L as outlined in the Environmental Impact Statement. The residential character of West Plymouth, historic significance of the Parting Ways Cemetery, water quality and access to the Plymouth Industrial Park and effect upon Charlotte Drive are certainly to experience a severe impact as a result of the construction of Al- 65.
ternative 4-L. The Plymouth Planning Board and it's staff is fully prepared to present a more detailed analysis of the negative impacts just outlined.

In conclusion, the opposition of the Town of Plymouth to Alternative Corridor 4-L is obvious and unmistakable. Alternatives 4-M and 4-M1 appear to provide far more advantageous economic, social and environmental benefits to the entire Plymouth area. In addition, the Massachusetts Department of Public Works, in its future analyses, must examine and address the present intersection of Routes 44 and 3, the visual impact of the intersection of the new Route 44 and Route 3 at Cherry Street and access to the historical areas of Plymouth and surrounding communities.

FOR THE BOARD OF SELECTMEN

William R. Griffin

William R. Griffin
Executive Secretary

WRG:mps

94

64. The chosen alignment is 4-M-5, which is a modification of 4-M-1.

65. The existing Route 3/Route 44 (Samoset Street) inter-change will be improved under the Route 44 construction contract.

Access to the historical areas of Plymouth will continue via the improved Route 3/Route 44 (Samoset Street) inter-change. Access to the surrounding communities will be provided by interchanges at Route 58 in Carver; Spring Street in Carver/Plympton; in the Plymouth Industrial Park; and at Route 3/Cherry Street in Plymouth.

The Commonwealth of Massachusetts

Executive Office of Environmental Affairs

Department of Environmental Quality Engineering

Southeast Region

Lakeville Hospital, Lakeville, Massachusetts 02346

ony D. Cortese, Sc. D
[redacted]
Commissioner

JL T ANDERSON
Environmental Engineer

JUN 20 1979

June 14, 1979

Justin Radlo, Chief Engineer
Mass. Department of Public Works
100 Nashua Street
Boston, Massachusetts 02114

RE: SMAPCD--Transportation--Proposed
Route 44 Expansion, Draft
Environmental Impact Statement

Dear Sir:

The Southeast Regional Office of the Department of Environmental Quality Engineering was recently asked by DPW's Environmental Section to review the Draft Environmental Impact Statement for proposed Route 44 Extension in Carver, Plympton, Kingston and Plymouth, Massachusetts. The review was conducted by the Southeastern Massachusetts Air Pollution Control District staff with respect to DEQE's consistency criteria. Our comments, which are presented in the following paragraphs, should not, however, be construed as our consistency determination. The consistency determination shall only be made upon receipt and review of the final document on this project.

Consistency Criteria Comments

With respect to the criteria we find no problems with the process used. The DPW's Environmental Section has been cooperative throughout. We have examined the air quality analysis performed and find no major problems with either the mesoscale or microscale analysis. In all cases the "build" alternatives have shown lower hydrocarbon and carbon monoxide emissions than the "no-build". Increases in hydrocarbon levels have been shown between the years 1990-2000 for all alternatives. The Final EIS should investigate this matter more fully. 66.

Specific Comments and Questions

Page 96: Construction Impacts could be expanded to include the efforts to be made to minimize the increases in pollutants expected during the construction period. 67.

Page 97: Although all of the "Build" alternatives show a decrease in the total pollution burden for hydrocarbons, the relocated Route 44 alternatives show the largest decreases. Therefore, on the basis of this analysis, alternatives 4, 5, 6 and 7 are more likely to improve air quality than alternatives 2 and 3. 68.

66. The analysis done in the FEIS indicates a decrease in hydrocarbon levels between the years 1984-1990 and 1990-2000 for theNo-Build Alternative and the years 1990-2000 for the 4-M-5 Preferred Alternative. In addition, the hydrocarbon levels are less for the 4-M-5 Alternative than for the No-Build in the years 1990 and 2000. These findings are consistent with the criterion for hydrocarbons in the 1982 Mass. State Implementation Plan. These decreases result from stricter controls under the Federal Motor Vehicle Emission Program and implementation of an Inspection Program, neither of which were not allowed for in the DEIS.

67. Mitigation of construction impacts are addressed more fully in the FEIS.

68. The Preferred Alternative 4-M-5 is a full route relocation similar to Alternatives 4, 5, 6 and 7 in the DEIS. HC levels are discussed above in Response # 66.

Section 11: Bikeways and Alternate Modes of Transportation. Although the discussion of bikeways and the Visitor's Center is very thorough, the section could be expanded to include commuter parking lots and public transportation. These are alternatives which can be attractive in terms of not only air quality but also congestion and energy conservation. The two regional planning agencies have conducted studies which addressed these issues. The Old Colony Planning Council has prepared a Route Three Corridor Study as well as a Region-wide Commuter Parking Study. A Transit Development Program for Southern Plymouth County was 69.
published by the Southeastern Regional Planning and Economic Development District. Both RPA's have also shown strong interest in the relocation of Route 44.

In conclusion, it appears that the proposed Route 44 Extension has the potential of meeting a variety of goals including those related to air quality. The Department of Public Works has shown its understanding of the extent to which projects impacts do indeed benefit air quality. It is hoped that the comments raised in this letter will assist you in developing the final document for this project.

Should you have any comments regarding the Region's comments, please contact Mr. Barry Porter of this office.

Very truly yours,

For the Commissioner

Robert E. Donovan, Chief
Air Quality Control Section

D/BP/lp

cc: Kenneth Hagg, DAHM

David Friend, MSPB

MEPA Unit

Donald White
EPA Region I
JFK Federal Building
Boston, Mass.

Old Colony Planning Council
232 Main Street
Brockton, Mass.

SERPEDD
Town Hall Annex
Marion, Mass.

69. There is a discussion of public transportation and commuter parking in Section 3-10 of the FEIS. There is a Park & Ride lot in the Plymouth Industrial Park at Cherry Street, which will be replaced with a new lot due to Route 44.

SECTION 9

TECHNICAL APPENDIX

1. WETLANDS

U.S. FISH AND WILDLIFE SERVICE WETLAND CLASSIFICATION SYSTEM

The U.S. Fish and Wildlife Service (U.S. FWS) wetland classification system developed by Cowardin _et al_ (1979) is a hierarchical approach allowing the classification of wetlands at various levels of specificity. Wetlands are defined by the U. S. FWS as follows:

> "Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water." (Cowardin _et al_., 1979).

Additionally, wetlands must have one or more of the following three attributes:

1. At least periodically, the land supports predominantly hydrophytes;
2. The substrate is predominantly undrained hydric soil; and
3. The substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

The broadest category of classification is the wetland System. System refers to a complex of wetlands and deepwater habitats that share the influence of similar hydrologic, geomorphologic, chemical, or biological factors.

The two Systems represented within the proposed Route 44 alignment include Palustrine and Riverine. As defined by the U.S. FWS, the Palustrine System includes:

> ". . . all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5^{o}/oo (parts per thousand). It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2 m at low water; and (4) salinity due to ocean-derived salts less than 0.50^{o}/oo."

The Riverine System includes:

> ". . . all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.50^{o}/oo."

At a more specific level, wetlands are categorized by Class. Class describes the general appearance of the habitat in terms of either the dominant life form of the vegetation or the physiography and composition of the substrate. Classes represented include Forested, Scrub/Shrub, Emergent, and Open Water.

Forested wetlands are characterized by woody vegetation that is six (6) meters (20 ft) tall or taller; while scrub/shrub wetland include areas dominated by woody vegetation less than six meters tall. Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens, with the former group of species present for most of the growing season in most years. Emergent wetlands are also usually dominated by perennial plants. Although not specifically identified in the classification plan, the inclusion by the U.S. FWS of the open water wetland Class provides for the consolidation of wetland classes whose precise identification and delineation is primarily dependent on substrate composition, the percent of vegetative cover, and the frequency and duration of flooding.

FIGURE 9-1-1

PLANT SPECIES RECORDED FOR WETLANDS
PREFERRED ALTERNATIVE 4-M-5

		Wetland Number																
Common Name	Scientific Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Red Maple	Acer rubrum		X	X	X		X		X	X	X	X	X	X	X	X	X	X
Elm	Ulmus americana																X	
Atlantic White Cedar	Chamaecyparis thyoides				X													
Black Willow	Salix nigra		X															
White Pine	Pinus strobus															X		
Pitch Pine	Pinus rigida																	
Black Cherry	Prunus serotina		X															
Red Cedar	Juniperus virginiana		X															
Bayberry	Myrica pensylvanica	X		X														
Poison Ivy	Rhus radicans		X	X														
Poison Sumac	Rhus vernix			X														
Sheep Laurel	Kalmia angustifolia			X							X		X	X		X	X	X
Ironwood	Carpinus caroliniana															X		
Witch Hazel	Hamamelis virginiana															X		
Alder	Alnus rugosa		X	X									X			X	X	
Arrowwood	Viburnum recognitum		X	X	X								X	X			X	
Pussy Willow	Salix discolor		X		X										X			X
Elderberry	Sambucus canadensis	X	X											X			X	
Highbush Blueberry	Vaccinium corymbosum	X		X	X		X		X	X	X	X	X	X	X	X	X	X
Swamp Azalea	Rhododendron viscosum			X	X		X		X	X			X	X		X		
Maleberry	Lyonia ligustrina				X													
Sweetbells	Leucothoe racemosa				X									X		X		
Sweet Pepperbush	Clethra alnifolia				X				X	X	X	X		X	X	X	X	
Silky Dogwood	Cornus amomum																X	
Buttonbush	Cephalanthus occidentalis			X														
Steeplebush	Spiraea tomentosa	X	X	X	X								X	X	X			X
Meadowsweet	Spiraea latifolia	X		X	X									X	X			X
Goldenrod	Solidago spp.	X	X															
Honeysuckle	Lonicera spp.	X	X															

FIGURE 9-1-1
(Continued)

Common Name	Scientific Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
										Wetland Number								
Smartweed	Polygonum spp.													X	X			
Jewelweed	Impatiens capensis	X	X															
Nightshade	Solanum nigrum	X																
Joe-Pye-Weed	Eupatorium maculatum		X															
Boneset	Eupatorium perfoliatum				X													
Dewberry	Rubus flagellaris			X														
Cranberry	Vaccinium macrocarpon			X	X													
Arrow-leaved Tearthumb	Polygonum sagittatum	X		X														
Swamp Milkweed	Asclepias incornata	X																
Yellow Loosestrife	Lysimachia terrestris	X	X															X
Burreed	Sparganium spp.			X														
Leather leaf	Chamaedaphne calyculata			X	X													
Waterwillow	Decodon verticillatus		X	X	X			X					X	X	X	X	X	
Tall Meadow Rue	Thalictrum polygamum																	
Cattail	Typha latifolia		X											X		X	X	
Skunk Cabbage	Symplocarpus foetidus		X											X		X	X	
Water Lily	Nymphaea odorata									X	X				X			
Spatterdock	Nuphar advena													X				
Pickerelweed	Pontederia cordata																X	
Arrowhead	Sagittaria spp.																X	X
Three-square Bulrush	Scirpus americanus																	X
Wool Grass	Scirpus cyperinus	X	X	X	X									X	X			X
Tussock Sedge	Carex stricta	X		X	X													
Sedge	Carex lurida	X													X		X	X
Spike Rush	Eleocharis spp.																	X
Soft Rush	Juncus effusus	X	X		X									X			X	X
Marsh Fern	Thelypteris palustris			X														X
Cinnamon Fern	Osmunda cinnamomea		X											X		X		
Sensitive Fern	Onoclea sensibilis	X	X															X
Duckweek	Lemna spp.	X												X			X	
Sphagnum	Sphagnum spp.			X	X								X	X	X	X	X	
Reed Grass	Phragmites communis			X		X								X				X

FIGURE 9-1-2

WILDLIFE SPECIES OBSERVED AND EXPECTED FOR WETLANDS
PREFERRED ALTERNATIVE 4-M-5

		Wetland Community Type				
Common Name	Scientific Name	Forested	Scrub/Shrub	Emergent	Open Water	Cranberry Bog
MAMMALS						
Opossum	Didelphis marsupialis	X				
Raccoon	Procyon lotor	X				
Striped Skunk	Mephitis mephitis	X		X		X
Woodchuck	Marmota monax	X		X		
Eastern Cottontail	Sylvilagus floridanus				X	
Gray Squirrel	Sciurus carolinensis	X				
Eastern Chipmunk	Tamias striatus	X				
Shorttail Weasel	Mustela erminea	X		X		
Longtail Weasel	Mustela frenata	X		X		
Muskrat	Ondatra zibethica			X	X	
Masked Shrew	Sorex cinereus	X	X			X
Northern Water Shrew	Sorex palustris	X	X			X
Shorttail Shrew	Blarina brevicauda		X	X		X
Starnose Mole	Condylura cristata		X	X		
Redback Vole	Clethrionomys gapperi	X	X			
Meadow Vole	Microtus pennsylvanicus	X	X	X		
Meadow Jumping Mouse	Zapus hudsonius		X	X		
Eastern Pipistrel	Pipistrellus subflavus	X				
BIRDS						
Great Blue Heron	Ardea herodias			X	X	
Green Heron	Butorides striatus	X	X	X	X	X
Black-crowned Night Heron	Nycticorax nycticorax	X		X	X	
Canada Goose	Branta canadensis			X	X	
Mallard	Anas platyrhynchos			X	X	

FIGURE 9-1-2
(Continued)

Common Name	Scientific Name	Wetland Community Type				
		Forested	Scrub/Shrub	Emergent	Open Water	Cranberry Bog
Black Duck	Anas rubripes			X	X	
Common Pintail	Anas acuta			X	X	
Green-winged Teal	Anas crecca			X	X	
Blue-winged Teal	Anas discors			X	X	
Wood Duck	Aix sponsa	X		X	X	
Virginia Rail	Rallus limicola			X	X	X
American Woodcock	Philohela minor	X	X			
Common Snipe	Capella gallinago			X		
Northern Harrier	Circus cyaneus			X		
Red-shouldered Hawk	Buteo lineatus	X				
Great Horned Owl	Bubo virginianus	X				
Barred Owl	Strix varia	X				
Belted Kingfisher	Megaceryle alcyon	X	X	X		
Common Flicker	Colaptes auratus	X				
Downy Woodpecker	Picoides pubescens	X				
Hairy Woodpecker	Picoides villosus	X				
Eastern Kingbird	Tyrannus tyrannus	X	X			
Eastern Phoebe	Sayornis phoebe	X	X			
Barn Swallow	Hirundo rustica			X		
Tree Swallow	Iridoprocne bicolor	X		X		
Bank Swallow	Riparia riparia			X		
American Crow	Corvus brachyrhynchos	X				
Blue Jay	Cyanocitta cristata	X				
Black-capped Chickadee	Parus atricapellus	X				
White-breasted Nuthatch	Sitta carolinensis	X				
Marsh Wren	Cistothorus palustris			X		
Veery	Catharus fuscescens	X				
Cedar Waxwing	Bombycilla cedrorum	X	X			
Yellow Warbler	Dendroica petechia	X	X			
Common Yellowthroat	Geothlypis trichas	X	X	X		

FIGURE 9-1-2
(Continued)

Common Name	Scientific Name	Wetland Community Type				
		Forested	Scrub/Shrub	Emergent	Open Water	Cranberry Bog
Red-winged Blackbird	Agelaius phoeniceus		X	X		
Common Grackle	Quiscalus quiscula	X	X			
Starling	Sturnus vulgaris	X				
Northern Oriole	Icterus galbula	X				
Brown Thrasher	Toxostoma rufum	X	X			
Gray Catbird	Dumetella carolinensis	X	X			
Slate-colored Junco	Junco hyemalis	X				
American Goldfinch	Carduelis tristis	X	X			
Rufous-sided Towhee	Pipilo erythrophthalmus	X				
Swamp Sparrow	Melospiza georgiana		X	X		
Song Sparrow	Melospiza melodia	X	X	X		
Tree Sparrow	Spizella arborea		X	X		
REPTILES						
Snapping Turtle	Chelydra serpentina			X	X	X
Eastern Painted Turtle	Chrysemys picta			X	X	X
Spotted Turtle	Clemmys guttata			X	X	X
Northern Water Snake	Natirx sipedon		X	X	X	X
Eastern Garter Snake	Thamnophis sirtalis	X	X	X		
Eastern Ribbon Snake	Thamnophis sauritus	X	X	X		
Eastern Milk Snake	Lampropeltis triangulum	X				
AMPHIBIANS						
Spotted Salamander	Ambystoma maculatum	X	X			
Red-spotted Newt	Notophthalmus viridescens	X	X	X	X	X

FIGURE 9-1-2
(Continued)

Common Name	Scientific Name	Wetland Community Type: Forested	Scrub/Shrub	Emergent	Open Water	Cranberry Bog
Northern Dusky Salamander	Desmognathus fuscus	X	X			
Red-backed Salamander	Plethodon cinereus	X				
Four-toed Salamander	Hemidactylium scutatum	X				
Northern Two-lined Salamander	Eurycea bislineata	X	X			
American Toad	Bufo americanus	X	X			
Spring Peeper	Hyla crucifer	X	X	X		X
Gray Tree Frog	Hyla versicolor	X	X			
Bullfrog	Rana catesbeiana			X	X	X
Green Frog	Rana clamitans			X	X	X
Wood Frog	Rana sylvatica	X	X			
Pickerel Frog	Rana palustris			X	X	X

REFERENCES

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2. NOISE

DETAILS OF NOISE MONITORING PROCEDURES

The data acquisition system utilized to measure environmental noise within the study area was a Community Noise Analyzer, which measured and computed statistical variations in noise levels during the 20 minute sample period. The Community Noise Analyzer automatically sampled the A-weighted sound pressure level at a rate of approximately four samples per second, sorted these sampled values into various electronic registers, and computed the L10 and other statistical indicators. At the end of the 20 minute observation period the noise level parameters were available on a pushbutton operated digital readout display. The Community Noise Analyzer was calibrated before every sample. The equipment used in this measuring system is listed in FIGURE 9-2-1.

FIGURE 9-2-1

NOISE MEASUREMENT INSTRUMENTATION
GR Type 1945 Community Noise Analyzer
GR Type 1560-P42 Microphone Preamplifier
GR Type 1961 Electret Microphone
GR Type 1562A Calibrator
Extension cable, tripod, windscreen

A total of 26 noise samples, two at each of the 13 monitoring locations, were collected at different times of the day. These sample locations are representative of the different levels of noise exposure along existing Rte. 44 and Corridor 4-M-5.

DETAILS OF TRAFFIC NOISE MODEL (SNAP 1.0)

SNAP 1.0 considers the population of vehicles to fall into three categories, "autos", "medium trucks", and "heavy trucks" [1]. SNAP 1.0 bases vehicle noise emissions on the reference energy mean emission level as a function of vehicle speed. As an example, an "auto" is modeled as a noise source that emits 70 dBA at 50 ft. at 50 mph. A "heavy truck" is modeled as emitting 85 dBA at 50 ft. at 50 mph, i.e. 15 dBA more than an "auto". This models a "heavy truck" as being equivalent to 32 "autos" passing by at the same time, which reflects the reality that existing heavy diesel trucks are much noisier than cars.

To calculate traffic noise generation from a given roadway situation using SNAP 1.0 or STAMINA 2.0, the following inputs are required:

Traffic Data

1. Operating speed
2. Vehicle count by vehicle category
3. Sound level adjustments for grade or traffic flow interruption.

Geometrics (x,y,z) Coordinates

1. Lane geometry
2. Receiver locations
3. Barrier geometry

The following are the main modeling assumptions used in the SNAP calculations:

1. Roadways are at the same elevation as adjacent land, so that there is no acoustic shielding by the roadway cross-section.

2. Roadways do not have any significant grade, i.e., 2.5% or less, except for Existing Route 44 near the intersection of Samoset Street and Seven Hills Road, where there is 7% grade.

3. Traffic flow is smooth and uninterrupted on all roadways except for ramps and local roads adjacent to interchanges along Relocated Route 44, and also at the Samoset Street interchange at Route 3.

The following are the modelling assumptions used in the STAMINA 2.0 calculations at two barrier locations - (1) relocated Route 44 at Brook Street and relocated Pleasant Street and (2) the Cherry Street interchange at Route 3.

1. Actual elevations of roadways, and receivers are used.

2. Roadways do not have any grade less than two percent except for Connector "C" of the Cherry Street interchange where there is a five percent grade.

3. Traffic flow is smooth and uninterrupted at the relocated Route 44/Brook Street location and at the Cherry Street interchange except for the ramps and Cherry Street.

The above modeling assumptions are believed to be conservative. By ignoring possible acoustic shielding in some situations, the predicted traffic noise levels may be as much as 5 dBA too high.

TRAFFIC ASSIGNMENTS USED FOR NOISE PREDICTIONS

Predicted Traffic Noise Levels used for impact assessment were determined using the Year 2000 forecasts of traffic provided by MDPW as shown in FIGURE 9-2-4.

Peak hourly traffic volumes and traffic mix percentages are shown in Table 9-2-2.

FIGURE 9-2-2

PEAK HOUR TRAFFIC VOLUME PERCENTAGES

	Existing Route 44	Relocated Route 44	All Other Roads
K	15%	15%	12%
T_{pk}	1%	1%	6%
	(heavy trucks)	(heavy trucks)	(4% medium trucks) (2% heavy trucks)

Notes:

1. K = Total Volume/ADT
2. T_{pk} = Truck Volume/Total Volume (during the peak hour)

DETAILS OF NOISE IMPACT DETERMINATION

The overall criteria for significant noise impact are set forth on FIGURE 9-2-3.

The first step was to develop noise contours which designate the noise level drop-off with distance from the roadway, based on the traffic noise calculations. After the noise contours were drawn on 1" = 1000' maps, the next step was to determine which sensitive receptors qualify as noise-impacted according to the criteria on FIGURE 3-4-1. A residence, church, school, or motel was judged to be impacted if any pertinent portion of the property was 69 dBA-L10 or more or if any pertinent portion of the property would be exposed to noise levels 15 dBA or more above existing noise levels.

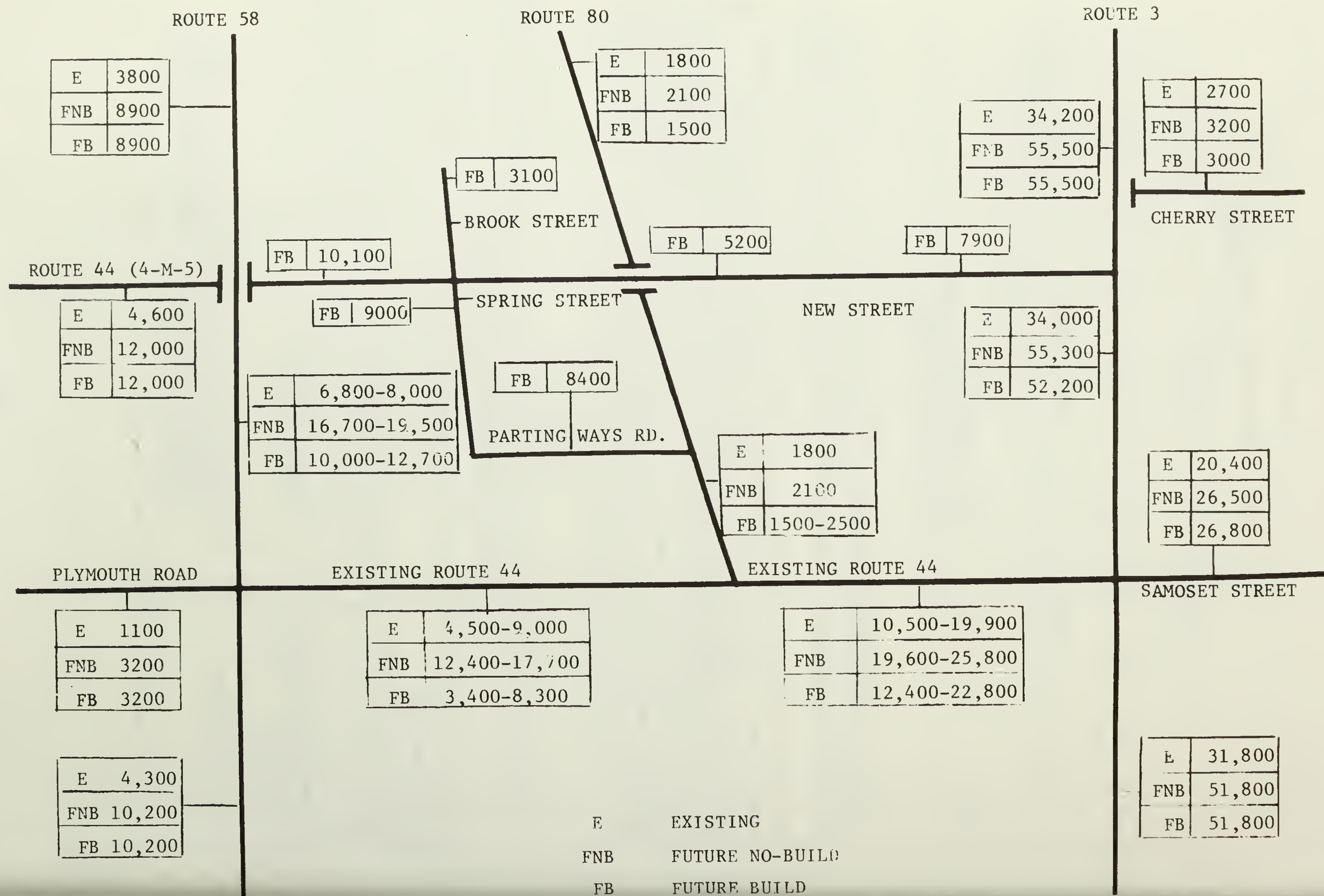
FIGURE 9-2-3

CRITERIA FOR TRAFFIC NOISE IMPACT

PROJECTED PEAK HOUR L10 NOISE LEVEL	IMPACT
INCREASE OF 15 dBA OR GREATER ABOVE EXISTING NOISE LEVEL	SEVERE IMPACT
69 dBA OR GREATER	APPROACHES OR EXCEEDS FHWA NOISE ABATEMENT CRITERIA FOR RESIDENTIAL AND OTHER CATEGORY B LAND USES

FIGURE 9-2-4

AVERAGE DAILY TRAFFIC VOLUMES (ADT)
(Used For Traffic Noise Calculations)



A comparison was made between the projected noise level at a sensitive receptor and the existing noise level determined from the nearest of the thirteen sound measurement locations subjected to similar traffic volumes. In rural areas, a sensitive receptor near a monitoring location with similar background noise was considered to have the same existing noise level as that at the monitoring location. The noise level at a sensitive receptor in the vicinity of a major road, such as Route 3 or existing Route 44, was based on the noise level at the nearest monitoring location and was derived from the equation, 15 Log(D) from the FHWA Highway Traffic Noise Prediction Model [2]. This equation corresponds to a noise drop-off rate with the distance from the source to the receiver of 4.5 dBA per doubling of that distance. This is valid when the ground is covered with grass and other vegetation.

At areas where noise barriers were analyzed, noise reduction estimates were based on a preliminary analysis of the shielding geometry and the STAMINA 2.0, and incorporated principles of the FHWA Highway Traffic Noise Prediction Model [2].

Calculations and documentation for the noise analysis are on file at the Massachusetts Department of Public Works.

LIST OF REFERENCES

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2. American National Standard Specification for Sound Level Meters, ANSI S1.4-1971

3. Based on measurements and published data, e.g. see Noise and Vibration Control, L.L. Beranek, ed. (McGraw Hill Book Co., Inc. N.Y. 1971)

4. Procedures for Abatement of Highway Traffic Noise and Construction Noise, Federal Highway Administration, FHPM 7-7-3 (August 9, 1982)

5. Highway Noise - A Design Guide for Highway Engineers, Highway Research Board, NCHRP Report 117 (1971)

6. User's Manual: FHWA Highway Traffic Noise Prediction Model, Snap 1.0, U.S. Department of Transportation, Federal Highway Administration, FHWA-RD-78-139 (January 1979)

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9. Noise Barrier Cost Reduction Procedure STAMINA 2.0/OPTIMA USER'S MANUAL. FHWA-EP-58-1, April 1982.

3. AIR QUALITY

The air quality analysis was performed for 1984 existing conditions and for two alternatives (No-Build and Build) for two future years (1990 and 2000). This Appendix presents the input data, assumptions, and methods of the analysis. Results are given in Section 4 of the Final EIS. The FInal EIS also contains maps of the study area showing the analysis locations.

MOTOR VEHICLE EMISSIONS ESTIMATES

Emissions from motor vehicles were estimated using factors (in grams per vehicle-mile) calculated by the U.S Environmental Protection Agency (EPA) MOBILE-3 computer program (1). (See Section 4-3 for reference.) The values of the input variables were chosen in consultation with the MA Department of Environmental Quality Engineering (DEQE) and are discussed below.

VEHICLE AGE MIX

Massachusetts registration data (1983) for automobiles and light duty trucks and national average values built into MOBILE-3 for other vehicles were used.

VEHICLE TYPE MIX

The vehicle classification data were supplied by the Massachusetts Department of Public Works (MDPW) and are reproduced below.

Vehicle Type	For Primary Roads (%)	For Secondary Roads (%)
Automobile	78	79
Light duty trucks	8	15
Heavy duty gasoline trucks	5	2
Heavy duty diesel trucks	8	3
Motorcycles	1	1

The MOBILE-3 model requires data for automobiles and light duty trucks to be further disaggregated by weight class and fuel type (gasoline or diesel), and it also accounts for changes over time in the proportion of diesel-powered vehicles in the total. Therefore, the MDPW data for autos and light trucks were adapted by proportioning the total percentages in the mix according to national average fractions for vehicle weight class, fuel type, and changes over time that are built into MOBILE-3.

CALINE3: CALIFORNIA LINE SOURCE DISPERSION MODEL - SEPTEMBER, 1979 VERSION

JOB: RTE 44 INT#3 NEW44/3/IND/CH 00 4MI 8FR   RUN: INT#3 MAIN ROADS NO RAMPS

I. SITE VARIABLES

U = 1.0 M/S   CLAS = 4 (D)   VS = 0.0 CM/S   ATIM = 60. MINUTES   MIXH =
G = 45. DEGREES   Z0 = 108. CM   VD = 0.0 CM/S   AMB = 0.0 PPM

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LINK LENGTH (M)	LINK BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)
301 NEW 44 WB	-549.	378.	146.	433.	697.	85.	AG	333.	7.2	0.0	7.3
302 NEW 44 EB	-549.	335.	61.	390.	612.	85.	AG	333.	7.2	0.0	7.3
303 RT 3 SB (N LEG)	311.	817.	366.	457.	364.	171.	AG	2081.	10.3	4.6	7.3
304 RT 3 SB (M LEG)	366.	457.	439.	0.	463.	171.	AG	2081.	10.3	4.6	7.3
305 RT 3 SB (S LEG)	439.	0.	530.	-305.	318.	163.	AG	2059.	10.3	4.6	7.3
306 RT 3 NB (N LEG)	329.	817.	384.	457.	364.	171.	AG	2081.	10.3	4.6	7.3
307 RT 3 NB (M LEG)	384.	457.	457.	0.	463.	171.	AG	2081.	10.3	4.6	7.3
308 RT 3 NB (S LEG)	457.	0.	549.	-305.	318.	163.	AG	2059.	10.3	4.6	7.3
309 CHERRY 1	-488.	701.	-183.	500.	365.	123.	AG	180.	12.5	0.0	7.3
310 CHERRY 2	-183.	500.	0.	451.	189.	105.	AG	180.	12.5	0.0	7.3
311 CHERRY 3	0.	451.	567.	579.	581.	77.	AG	180.	12.5	0.0	7.3
312 CHERRY 4	567.	579.	750.	677.	207.	62.	AG	180.	12.5	0.0	7.3
313 NEW W.CHERRY(N)	122.	311.	122.	482.	171.	360.	AG	120.	12.5	0.0	7.3
314 NEW W.CHERRY(S)	122.	311.	49.	183.	147.	210.	AG	120.	12.5	0.0	7.3
315 NEW W.CHERRY(E)	122.	311.	183.	311.	61.	90.	AG	50.	12.5	0.0	7.3
316 W.CHERRY	183.	311.	354.	201.	203.	123.	AG	50.	12.5	0.0	7.3
317 OLD W.CHERRY(N)	183.	311.	43.	463.	207.	317.	AG	0.	0.0	0.0	7.3
318 OLD W.CHERRY(S)	183.	311.	49.	183.	185.	226.	AG	0.	0.0	0.0	7.3

FIGURE 9-3-1
EXAMPLE OF CALINE3 - RUN

NOTE: RAMPS WERE RUN SEPARATELY, SINCE CALINE3 ONLY ACCEPTS UP TO 20 LINKS PER RUN.

CALINE3: CALIFORNIA LINE SOURCE DISPERSION MODEL - SEPTEMBER, 1979 VERSION

JOB: RTE 44 INT#3 NEW44/3/IND/CH 00 4M1 8HR   RUN: INT#3 MAIN ROADS NO RAMPS

I. SITE VARIABLES

U = 1.0 M/S	CLAS = 4 (D)	VS = 0.0 CM/S	ATIM = 60. MINUTES
BRG = 45. DEGREES	ZO = 108. CM	VD = 0.0 CM/S	AMB = 0.0 PPM

III. RECEPTOR LOCATIONS AND MODEL RESULTS

RECEPTOR	COORDINATES (M) X	Y	Z	TOTAL + AMB (PPM)
1. 31 INDUS.BLDG W	-293.	542.	1.5	0.0
2. 32 RESIDENCE NW	390.	616.	1.5	0.0
3. 33 COML BLDG N	445.	567.	1.5	0.0
4. 34 RESIDENCE N	622.	591.	1.5	0.1
5. 35 RESIDENCE NE	628.	415.	1.5	0.0
6. 36 RESIDENCE E	543.	-85.	1.5	0.0
7. 37 BLDG SE	341.	177.	1.5	0.3
8. 38 INDUS.BLDG S	183.	262.	1.5	0.0

FIGURE 9-3-1 (CONTINUED)

PERCENTAGE OF COLD AND HOT START OPERATION

Vehicle exhaust emission rates vary according to the temperature (operating phase) of the engine. The percentages of travel by operating phase, as agreed upon in consultation with DEQE, are as follows:

Condition		Cold Hot Percentages
Microscale:	1-hour	50.0/10.0/50.0
	8-hour	20.6/27.3/20.6
Mesoscale:		20.6/27.3/20.6

This assumption is conservative (tending to overestimate emissions) because the limited access roads in the study area would tend to have very low percentages of vehicles in the cold hot phase, rather than the 10-50% range used in the analysis.

AVERAGE OPERATING SPEED

This varies for each roadway link. Speed data were supplied by MDPW and range from 15 to 50 mph.

AMBIENT TEMPERATURE

Emission rates of CO and NMHC increase with decreasing temperatures, while NO_x emissions increase with increasing temperatures. As agreed upon in consultation with DEQE, CO emissions were estimated at 33° F, and NMHC and NO_x emissions were estimated at 75° F.

VEHICLE INSPECTION AND MAINTENANCE (I/M)

The effect of the Massachusetts I/M program was included in the modeling effort, as specified by DEQE. This included an inspection/maintenance flag with 15% stringency and no mechanics training.

OTHER VARIABLES

The averages built into MOBILE-3 were used.

MESOSCALE ANALYSIS

The total pollutant burdens of CO, NMHC, NO_x in tons per year were estimated for the study area. The emissions for each roadway link are the product of the annual vehicle-miles traveled (VMT) and the appropriate emission factor (calculated as explained in the previous section). MAP 4-R identifies the roadway links considered in the analysis. The traffic data (average daily traffic) and link lengths used in the VMT computations were based on existing traffic volume counts and projections developed by MDPW. The total emissions, given in the Final EIS for each pollutant, are the sum of the emission contributions from each roadway link.

MICROSCALE ANALYSIS

After the pollutants are discharged into the atmosphere by the various emission sources, the pollutants are transported by the prevailing wind and diluted through dispersion by atmospheric turbulence. The resulting pollutant concentration of any location in the study area is determined by the rate of emission of the pollutant sources, the spatial distribution of the emission sources, and the meteorology variables. Ambient CO concentrations caused by motor vehicles were estimated by the Federal Highway Administration's CALINE-3 computer model (See Section 4-3 for reference). Inputs for this model were data for roadway and receptor geometry, traffic volumes, emission rate, and meteorological conditions. These inputs and the sources of data are as follows.

TRAFFIC VOLUMES

MDPW counts and projections. These are quite conservative, since they include summer peak traffic conditions, whereas peak CO emissions occur in winter.

EMISSION RATES

Emission factors specific to each microscale roadway link were calculated using MOBILE-3, as discussed above.

Meteorological conditions comprise several variables, as detailed below, and were chosen in consultation with DEQE.

WIND SPEED

A speed of 1.0 m/sec was used for the 1-hour analysis, and 1.6 m/sec for the 8-hour case.

WIND DIRECTION

The wind direction was varied in the modeling effort and the direction which produced the worst-case (highest) CO concentration at each receptor was used.

ATMOSPHERIC STABILITY

Pasquill-Gifford Class D (neutral).

BACKGROUND VALUES

Back CO concentrations used in the predictions vary by averaging time and analysis year as shown below.

Concentrations are in parts per million (ppm).

1984	1990	2000	
One-Hour case	3.0	2.0	1.2
Eight-Hour case	1.0	1.0	1.0

FIGURE 9-3-1 gives an example of the CALINE-3 input and output.

The procedure for converting the modeled CO concentrations was agreed upon in discussions with DEQE. Concentrations greater than the National Ambient Air Quality Standard for CO occur over 8 hours, rather than over 1 hour. Therefore, the 8-hour case is of greatest importance and should be modeled most accurately. For this analysis, the CALINE-3 model was run with 8-hour traffic volumes and emission rates. However, the low wind speed of 1.0 m/sec was used because it results in the highest CO concentrations. SInce CO levels in the study area were expected to be low, the use of a higher wind speed would have sacrificed useful resolution in the model results. In dispersion modeling, CO concentrations vary inversely with wind speed. Therefore, the modeled concentrations were multiplied by 1.0/1.6 (0.6245) to derive the impact for the 8-hour case. The total predicted 8-hour CO concentration is the sum of the modeled concentration (as adjusted) and the 8-hour background level.

To derive the 1-hour CO concentration, the wind speed was left at 1.0 m/sec but two other adjustments were made to the modeled results. First, traffic volumes were adjusted to reflect the higher peak hour volumes relative to the lower hourly averages for 8 hours. Based on the MDPW traffic data, a value of 1.75 was chosen for this adjustment factor. This factor is conservative because it represents the maximum of the various 1-hour and 8-hour values calculated from the MDPW traffic data.

The second adjustment applied to the 8-hour modeled results was an emission rate adjustment factor. The emission rate adjustment factor accounts for the different proportions of vehicles operating in the "cold start" phase between the 1-hour and the 8-hour period. Vehicles with cold engines emit more CO than vehicles with warmed-up engines. At the direction of the DEQE, the proportion of vehicles in the "cold" and "hot start" phases was 50% and 10%, respectively, for the 1-hour case. For the 8-hour analysis, the proportions were 20.6% and 27.3%, respectively. As a result, the 1-hour emission factors for moving traffic calculated by the MOBILE-3 model are 55.1% higher than the 8-hour values. Therefore, the 8-hour modeled results were further adjusted by a factor of 1.551 in deriving the 1-hour results. The total predicted 1-hour CO concentration is the sum of the modeled concentration (as adjusted) and the 1-hour background level.

The microscale analysis did not consider vehicle queuing because all the analysis locations are grade-separated interchanges rather than at-grade intersections. However, it is possible that during periods of heaviest traffic some queues could develop at the ramps leading to and from the main roads. Following discussions with DEQE, the interchange at Route 3 ans Samoset Street was considered the most likely location at which queuing may occur. This location was therefore chosen to test the sensitivity of the results to the impacts of (queued) vehicles. Hypothetical worst-case queues were located at each ramp or main road approach where an opposed left turn is possible. The average queue length was assumed to be 100 feet, and the average delay per vehicle was assumed to be 30 seconds. For every year and alternative, the maximum impact of the queues was less than 0.1 ppm. Therefore, the impact of vehicle queuing on microscale CO concentrations is not expected to be significant.